0101473

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 300-FF-2 **Control No.:** 2011-106

Waste Site Code(s)/Subsite Code(s):

300-219, 300-224, 333 WSTF

Reclassification Category: Interim ☒ Final ☐

Reclassification Status: Closed Out ☒ No Action ☐ Rejected ☐ RCRA Postclosure ☐ Consolidated ☐ None ☐

Approvals Needed: DOE ☒ Ecology ☐ EPA ☒

Description of current waste site condition:

The 300-219, 300-224, and 333 WSTF waste sites are part of the 300-FF-2 Operable Unit. The 300-219 waste site consists of the transfer lines inside the 300-224 Waste Acid Treatment System (WATS) trench. The 300-224 WATS trench ran between the 313 Building, the 303-F Building, the 311 Tank Farm, the 333 Building, the 334-A Building, and the 334 Tank Farm. The 333 WSTF waste site is located on the west side of the former 333 Building. This site was an above-grade tank farm containing three cylindrical tanks that stood upright within a concrete containment basin.

Remedial action at the 300-219, 300-224, and 333 WSTF waste sites was performed from December 4, 2009, to May 23, 2011, to meet remedial action objectives (RAOs) and remedial action goals (RAGs) of the *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington* (300-FF-2 ROD) U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 2001). The waste sites were excavated to depths of 0.5 m (1.6 ft) to over 1.5 m (4.9 ft) below ground surface, resulting in approximately 581 bank cubic meters (760 bank cubic yards) of soil disposed at the Environmental Restoration Disposal Facility (ERDF) at the 200 Area of the Hanford Site. The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the ERDF, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification as Interim Closed Out.

Basis for reclassification:

Following remediation, verification sampling was conducted on August 25, 2011. The sample results were evaluated in comparison to the RAGs. In accordance with this evaluation, the verification sampling results support a reclassification of the 300-219, 300-224, and 333 WSTF waste sites to Interim Closed Out. The current site conditions achieve the RAGs established by the 300-FF-2 ROD (EPA 2001) and the *Remedial Design Report/Remedial Action Work Plan for the 300 Area*, (300 Area RDR/RAWP) DOE/RL-2001-47, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2009). The results of verification sampling allow for industrial land use and also demonstrate that the 300-219, 300-224, and 333 WSTF waste sites are protective of groundwater and the Columbia River. The 300-219, 300-224, and 333 WSTF waste sites do not meet the RAOs and RAGs for unrestricted land use; therefore, institutional controls to maintain industrial land use of the site are required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 300-219, 300 Area Waste Transfer Line; 300-224, WATS and U-Bearing Piping Trench; and 333 WSTF, West Side Tank Farm* (attached).

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WASTE SITE RECLASSIFICATION FORM

Operable Unit: 300-FF-2 **Control No.:** 2011-106

Waste Site Code(s)/Subsite Code(s):

300-219, 300-224, 333 WSTF

Project Manager comments:

Waste Site Controls:

Engineered Controls: ☐ Yes ☐ No Institutional Controls: ☒ Yes ☐ No O&M Requirements: ☐ Yes ☐ No

If any of the Waste Site Controls are checked Yes, specify control requirements including reference to the Record of Decision, TSD Closure Letter, or other relevant documents:

The 300-219, 300-224, 333 WSTF waste sites do not meet the RAGs and RAOs for unrestricted land use; therefore, institutional controls to maintain industrial land use of these sites are required as established in the 300-FF-2 ROD (EPA 2001).

M. S. French	MS French	1/9/12
DOE Federal Project Director (printed)	Signature	Date
Ecology Project Manager (printed)	Signature	Date
L. E. Gadbois	Larry Gadbois	Jan 9, 2012
EPA Project Manager (printed)	Signature	Date

 A-6006-136 (REV 0)

REMAINING SITES VERIFICATION PACKAGE FOR THE 300-219, 300 AREA WASTE TRANSFER LINE; 300-224, WATS AND U-BEARING PIPING TRENCH; AND 333 WSTF, WEST SIDE TANK FARM

Attachment to Waste Site Reclassification Form 2011-106

November 2011

REMAINING SITES VERIFICATION PACKAGE FOR THE 300-219, 300 AREA WASTE ACID TRANSFER LINE; 300-224, WATS AND U-BEARING PIPING TRENCH; 333 WSTF, WEST SIDE TANK FARM

EXECUTIVE SUMMARY

The 300-219, 300-224, and 333 WSTF waste sites are part of the 300-FF-2 Operable Unit. The 300-219 waste site consists of the transfer lines inside the 300-224 Waste Acid Treatment System (WATS) trench. The 300-224 WATS trench ran between the 313 Building, the 303-F Building, the 311 Tank Farm, the 333 Building, the 334-A Building, and the 334 Tank Farm. The 333 WSTF waste site is located on the west side of the former 333 Building. This site was an above-grade tank farm containing three cylindrical tanks that stood upright within a concrete containment basin.

Remedial action at the 300-219, 300-224, and 333 WSTF waste sites was performed from December 4, 2009, to May 23, 2011, to meet remedial action objectives (RAOs) and remedial action goals (RAGs) of the *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington* (300-FF-2 ROD) (EPA 2001). The waste sites were excavated to depths of 0.5 m (1.6 ft) to over 1.5 m (4.9 ft) below ground surface, resulting in approximately 581 bank cubic meters (760 bank cubic yards) of soil disposed at the Environmental Restoration Disposal Facility (ERDF) at the 200 Area of the Hanford Site. The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the ERDF, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification as Interim Closed Out.

Following remediation, verification sampling was conducted on August 25, 2011. The results indicated that the waste removal action achieved compliance with the RAOs and RAGs for the 300-219, 300-224, and 333 WSTF waste sites. A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the 300-219, 300-224, and 333 WSTF waste sites in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2007).

Table ES-1. Summary of Remedial Action Goals for the 300-219, 300-224, and 333 WSTF Waste Sites. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain less than or equal to 15-mrem/yr dose rate above background over 1,000 years.	Maximum dose rate for the 300-219, 300-224, and 333 WSTF waste sites estimated using industrial generic equivalence lookup values is 8.3 mrem/yr above background.	Yes
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes

Table ES-1. Summary of Remedial Action Goals for the 300-219, 300-224, and 333 WSTF Waste Sites. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	The hazard quotients for individual nonradionuclide COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for all sampling areas (7.6×10^{-2}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	Excess cancer risk values for individual nonradionuclide COPCs are $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess carcinogenic risk for all sampling areas (9.5×10^{-12}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	No radionuclide COPCs were quantified above groundwater/river protection lookup values.	Yes
	Attain National Primary Drinking Water Regulations: 4 mrem/yr (beta/gamma) dose standard to target receptor/organ [a].	No radionuclide COPCs were quantified above groundwater/river protection lookup values.	
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide for DOE Order 5400.5 [b].	No alpha-emitting radionuclide COPCs were quantified above groundwater/river protection lookup values.	
	Meet total uranium standard of 21.2 pCi/L [c].	Uranium was quantified below levels that are protective of 300 Area groundwater.	
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	Residual concentrations of total chromium, copper, and zinc exceeded soil RAGs for the protection of groundwater and/or the Columbia River. However, RESRAD modeling predicts that these constituents will not migrate to groundwater (and thus the Columbia River) at concentrations exceeding groundwater or river criteria within 1,000 years. Therefore, residual concentrations achieve the remedial action objectives for groundwater and river protection [d].	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).

[b] *Radiation Protection of the Public and Environment* (DOE Order 5400.5).

[c] Based on the isotopic distribution of uranium in the Hanford Site Background, the 30 µg/L MCL (40 *Code of Federal Regulations* 141.66) corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).

[d] Based on RESRAD modeling using input parameters and soil-partitioning coefficients from the *Remedial Design Report/Remedial Action Work Plan for the 300 Area* (RDR/RAWP) (DOE-RL 2009) for an industrial exposure scenario, residual concentrations of total chromium, copper, and zinc are not expected to migrate vertically in 1,000 years (based on the contaminant with the lowest distribution coefficient [copper] of 22 mL/g). The vadose zone underlying the soil below the site is approximately 9 m (30 ft) thick based on an elevation at maximum excavation depth of 115 m (377 ft) and a groundwater elevation of approximately 106 m (348 ft) (DOE-RL 2010a). Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
MCL = maximum contaminant level
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose assessment model)

In accordance with this evaluation, the verification sampling results support a reclassification of this site to Interim Closed Out. The current site conditions achieve the RAOs and the corresponding RAGs established in the *Remedial Design Report/Remedial Action Work Plan for the 300 Area* (DOE-RL 2009) and the 300-FF-2 ROD (EPA 2001). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by an industrial land-use scenario and are protective of groundwater and the Columbia River. The 300-219, 300-224, and 333 WSTF waste sites do not meet the RAGs and RAOs for unrestricted land use; therefore, institutional controls to maintain industrial land use of the sites are required.

Soil cleanup levels were established in the 300-FF-2 ROD (EPA 2001) based, in part, on a limited ecological risk assessment. Although not required by the 300-FF-2 ROD, a comparison against ecological risk screening levels has been made for the site contaminants of potential concern and other constituents. Those constituents exceeding the ecological screening levels in the *Washington Administrative Code* Chapter 173-340, Table 749-3, were boron, copper, uranium, vanadium, and zinc. U.S. Environmental Protection Agency ecological soil screening levels were exceeded for copper, lead, manganese, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the maximum sample levels of manganese and vanadium are below Hanford Site background levels, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 300-219, 300 AREA WASTE TRANSFER LINE; 300-224, WATS AND U-BEARING PIPING TRENCH; AND 333 WSTF, WEST SIDE TANK FARM

STATEMENT OF PROTECTIVENESS

The 300-219, 300 Area Waste Transfer Line (300-219); 300-224, WATS and U-Bearing Piping Trench (300-224); and 333 WSTF, West Side Tank Farm (333 WSTF) waste sites verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 300 Area* (RDR/RAWP) (DOE-RL 2009) and the *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington* (300-FF-2 ROD) (EPA 2001). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by an industrial land-use scenario and are protective of groundwater and the Columbia River. The 300-219, 300-24, and 333 WSTF waste sites do not meet the remedial action goals (RAGs) and remedial action objectives (RAOs) for unrestricted land use; therefore, institutional controls to maintain industrial land use of the sites are required.

Soil cleanup levels were established in the 300-FF-2 ROD (EPA 2001) based in part on a limited ecological risk assessment. Although not required by the 300-FF-2 ROD, a comparison against ecological risk screening levels has been made for the site contaminants of potential concern (COPCs) and other constituents. Those constituents exceeding the ecological screening levels in the *Washington Administrative Code* (WAC) Chapter 173-340, Table 749-3 were boron, copper, uranium, vanadium, and zinc. U.S. Environmental Protection Agency (EPA) ecological soil screening levels were exceeded for copper, lead, manganese, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the maximum sample levels of manganese and vanadium are below Hanford Site background levels, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

GENERAL SITE INFORMATION AND BACKGROUND

The 300-219, 300-224, and 333 WSTF waste sites are part of the 300-FF-2 Operable Unit. The 300-219 waste site consists of the transfer lines inside the 300-224 Waste Acid Treatment System (WATS) trench (Figures 1 and 2) and was identified in the *Explanation of Significant Differences for the 300-FF-2 Operable Unit Interim Action Record of Decision Hanford Site Benton County, Washington* (EPA 2009) as an additional waste site where remediation was necessary. The 300-224 WATS trench, identified for remediation in the 300-FF-2 ROD (EPA 2001), ran between the 313 Building, the 303-F Building, the 311 Tank Farm, the 333 Building, the 334-A Building, and the 334 Tank Farm. The 333 WSTF waste site, located on the west side of the former 333 Building, was identified for remediation in the *Fact Sheet: 300 Area*

Figure 1. The 300-219, 300-224, and 333 WSTF Waste Sites Location Map.

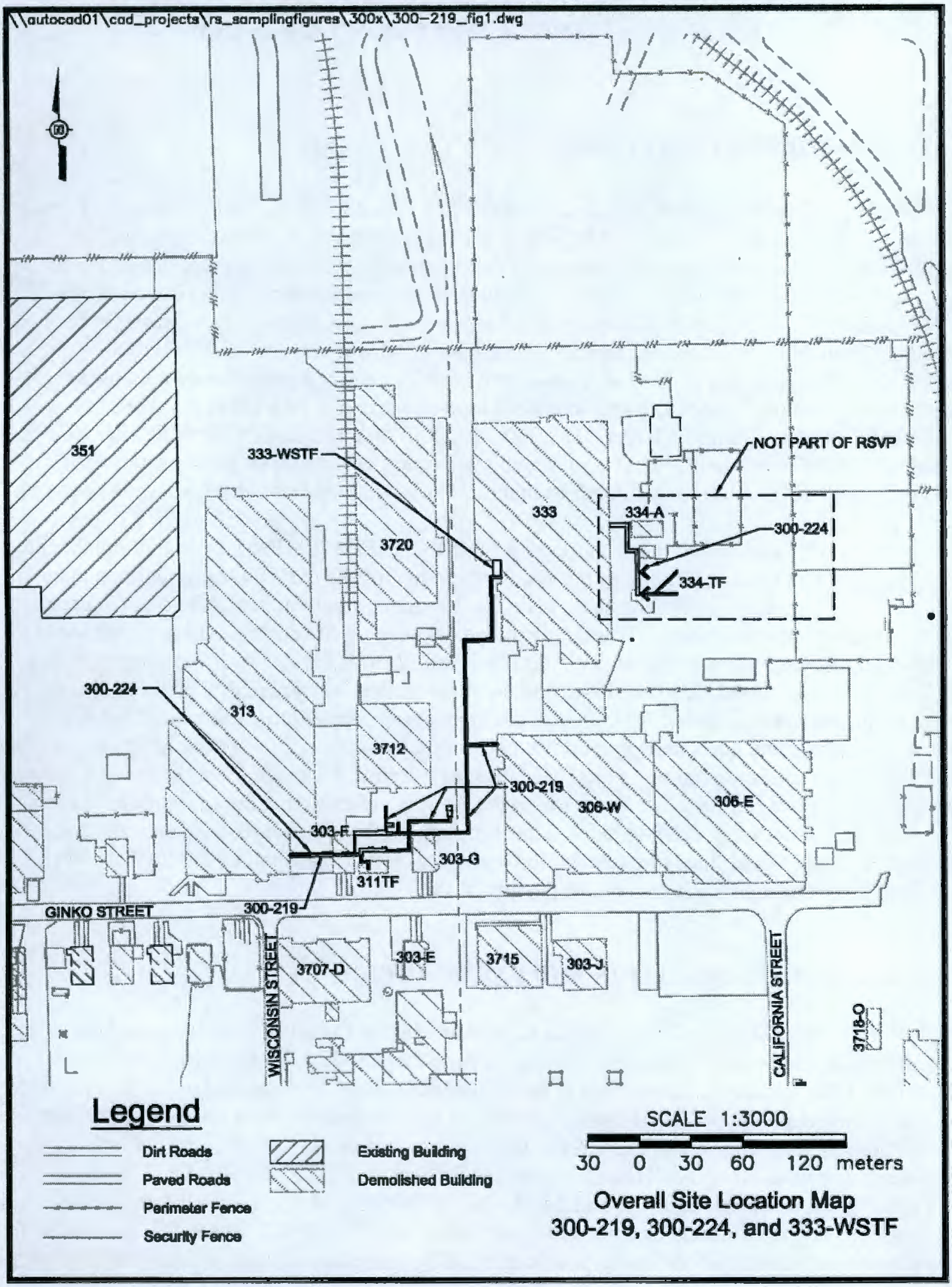
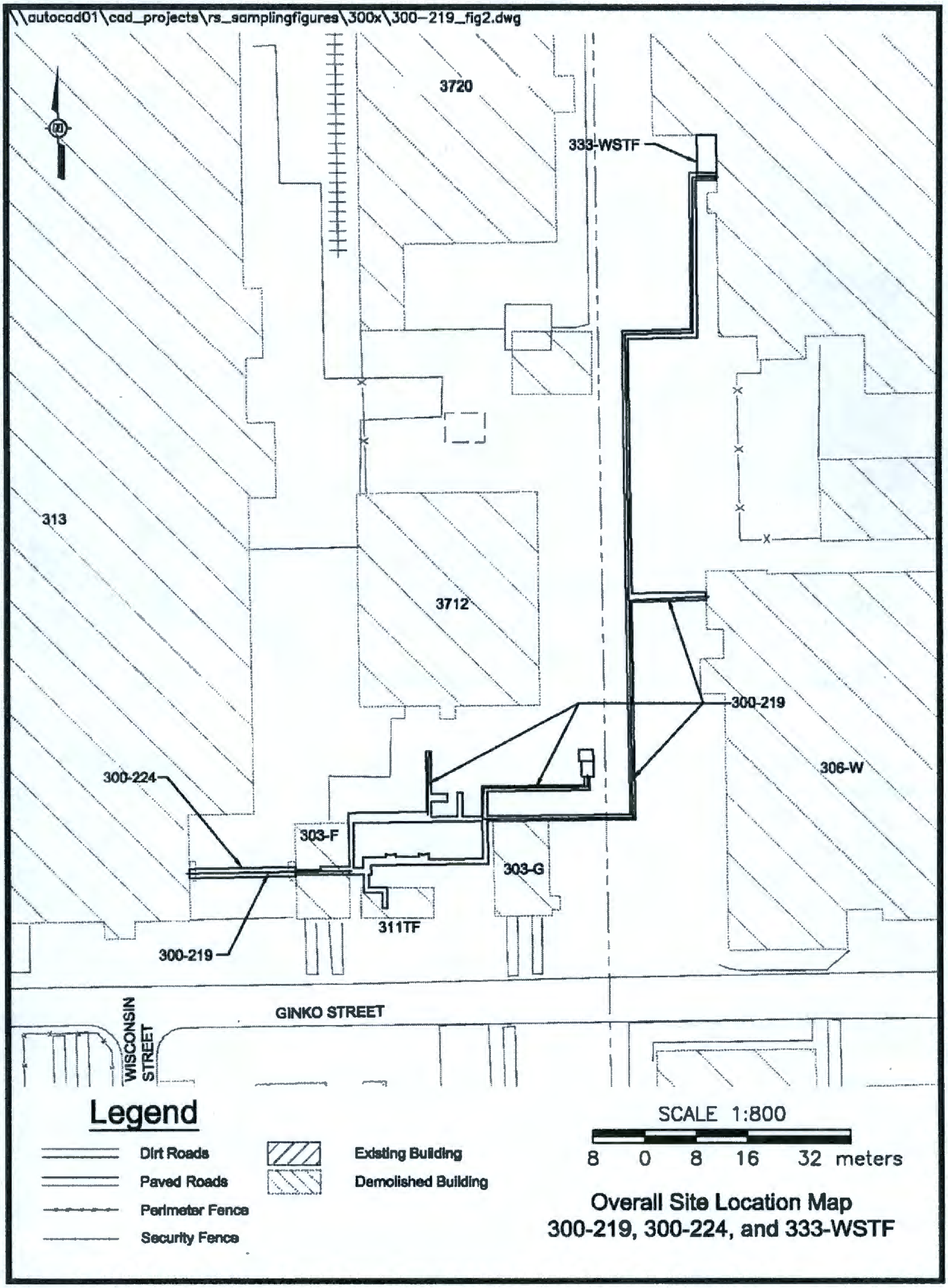
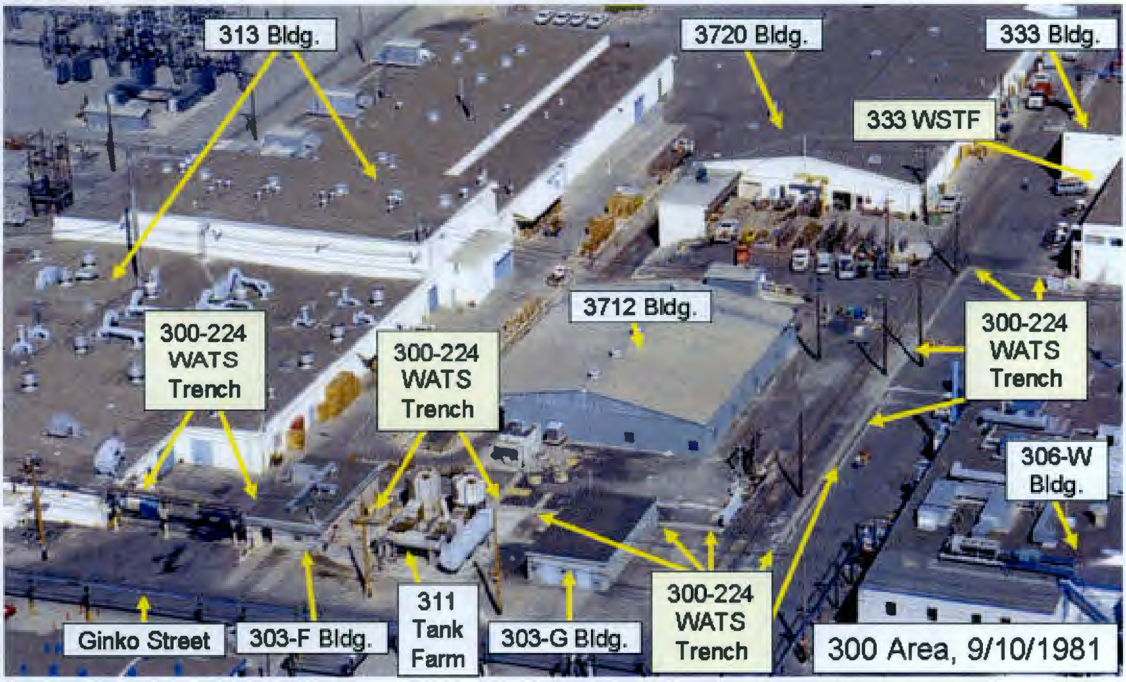


Figure 2. The 300-219, 300-224, and 333 WSTF Waste Sites Expanded Location Map.



"Plug-In" Waste Sites for Fiscal Year 2011 (DOE-RL 2011b). An aerial view of the 300 Area in the vicinity of that portion of the 300-219, 300-224, and 333 WSTF waste sites addressed by this remaining sites verification package is shown in Figure 3.

Figure 3. Aerial View of the 300-219, 300-224, 333 WSTF Area in 1981 (View to Northwest).



A schematic drawing of the WATS trench adapted from the *300 Area Waste Acid Treatment System Closure Plan* (DOE-RL 1999) is shown in Figure 4. Note that the portions of the WATS trench inside the 333 Building and east of the 333 Building are not part of this interim closeout document. The 618-1 Burial Ground portion of the 300-219 and 300-224 waste sites was clean closed as part of the 300 Area WATS *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and disposal unit as certified by Washington State Department of Ecology in December 2001 (Ecology 2005). The 300-219 and 300-224 waste sites addressed in this document is that portion of the WATS trench from the 313 Building to the 333 Building.

The 333 WSTF waste site is located on the west side of the former 333 Building (Figure 5). This site was an above-grade tank farm containing three cylindrical tanks that stood upright within a concrete containment basin. The concrete containment basin was 6 by 4.2 m (19.7 by 13.8 ft) with a depth of 0.4 m (1.3 ft). Figure 5 shows the close proximity of the 333 WSTF location to the WATS trench and thus its suitability for inclusion in this interim closure document.

Figure 4. 300 Area WATS Trench Schematic Drawing.

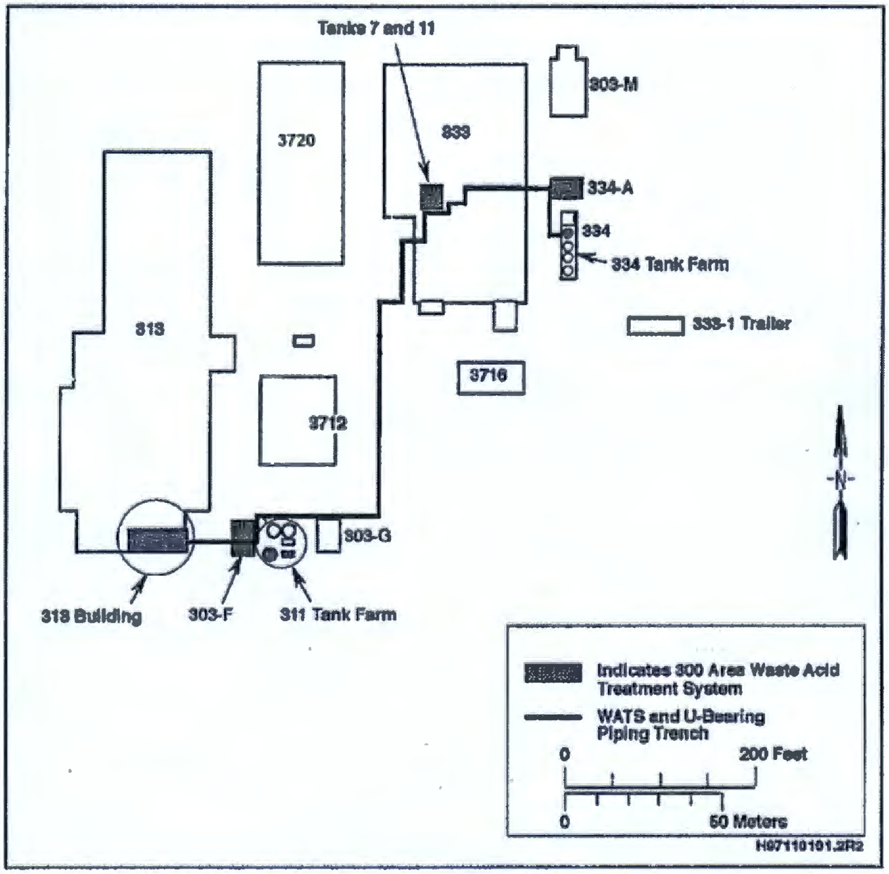


Figure 5. The 333 West Side Tank Farm (View to East-Northeast).

The 300 Area WATS began partial operations in January 1973 with tank storage and treatment of waste acid and entered full operations in 1975. The primary source of the waste acid was N Reactor fuel fabrication operations that occurred in tanks in the 333 Building from 1961 until 1987. The waste acids from these operations that contained nonrecoverable uranium were treated in the 300 Area WATS. Because this acid waste contained small amounts of uranium, the waste is considered to have been a mixed waste entering the 300 Area WATS (DOE-RL 1999).

The 300 Area WATS permanently ceased operations in 1995. Partial clean closure activities for this unit began in 1996 and were completed in September 1999. Clean closure activities occurred in three phases, in accordance with the approved clean closure plan and the requirements of Part V, Chapter 20, of the Hanford Facility RCRA Permit (Permit Number WA7890008967). Clean closure was achieved for all 300 Area WATS locations and components in October 2005 (Ecology 2005).

Geophysical Survey

Existing geophysical surveys were reviewed and compared to cold and dark certificates issued under Excavation Permits DAN-3683-1 and DAN-3864a (Olsson 2011).

Site Visits

Site visits to the 300-219, 300-224, and 333 WSTF waste sites were performed on June 2 and June 6, 2011, to observe and photograph the post-remediation status of the waste sites (Figures 6, 7, and 8). Note that the 300-219 waste site is located entirely within the 300-224 waste site, so only the 300-224 waste site is labeled in the photographs.

REMEDIAL ACTION SUMMARY

Remediation of the 300-219 and 300-224 waste sites was performed from December 14, 2009, through May 23, 2011. The majority of the soil within the waste sites' footprint was excavated to a depth of 0.5 to 1.0 m (1.6 to 3.3 ft) below ground surface (bgs); the soil under the 300-224 loading area[1] was excavated to a depth of over 1.5 m (4.9 ft) bgs. The resulting 541 bank cubic meters (BCM) (708 bank cubic yards [BCY]) of soil was disposed at the Environmental Restoration Disposal Facility (ERDF).

Remediation of the 333 WSTF waste site was performed on December 14, 2009. The soil within the waste site footprint was excavated to a depth of 1.0 m (3.3 ft) bgs, and the resulting 40 BCM (52 BCY) of soil was disposed at the ERDF.

[1] The 300-224 loading area is the northeast end of the second trench north of the 303-G Building (Figure 2).

Figure 6. Post-Remediation Photograph of the 300-224 Waste Site North Area (View to South).

Figure 7. Post-Remediation Photograph of the 300-224 Waste Site South Area (View to West).

Figure 8. Post-Remediation Photograph of the 333 WSTF Waste Site Area (View to Northeast).

On February 1, 2011, radiological field screening for gamma activity was conducted, and, on May 2, 2011, radiological field screening for beta activity was conducted in the 300-219 and 300-224 waste site areas. The radiological field screening surveys did not indicate any significant residual radiological activity (Figures 9 and 10). The small 333 WSTF waste site area is just north of these radiological surveys and received a focused sample (FS-17) at the center of that site.

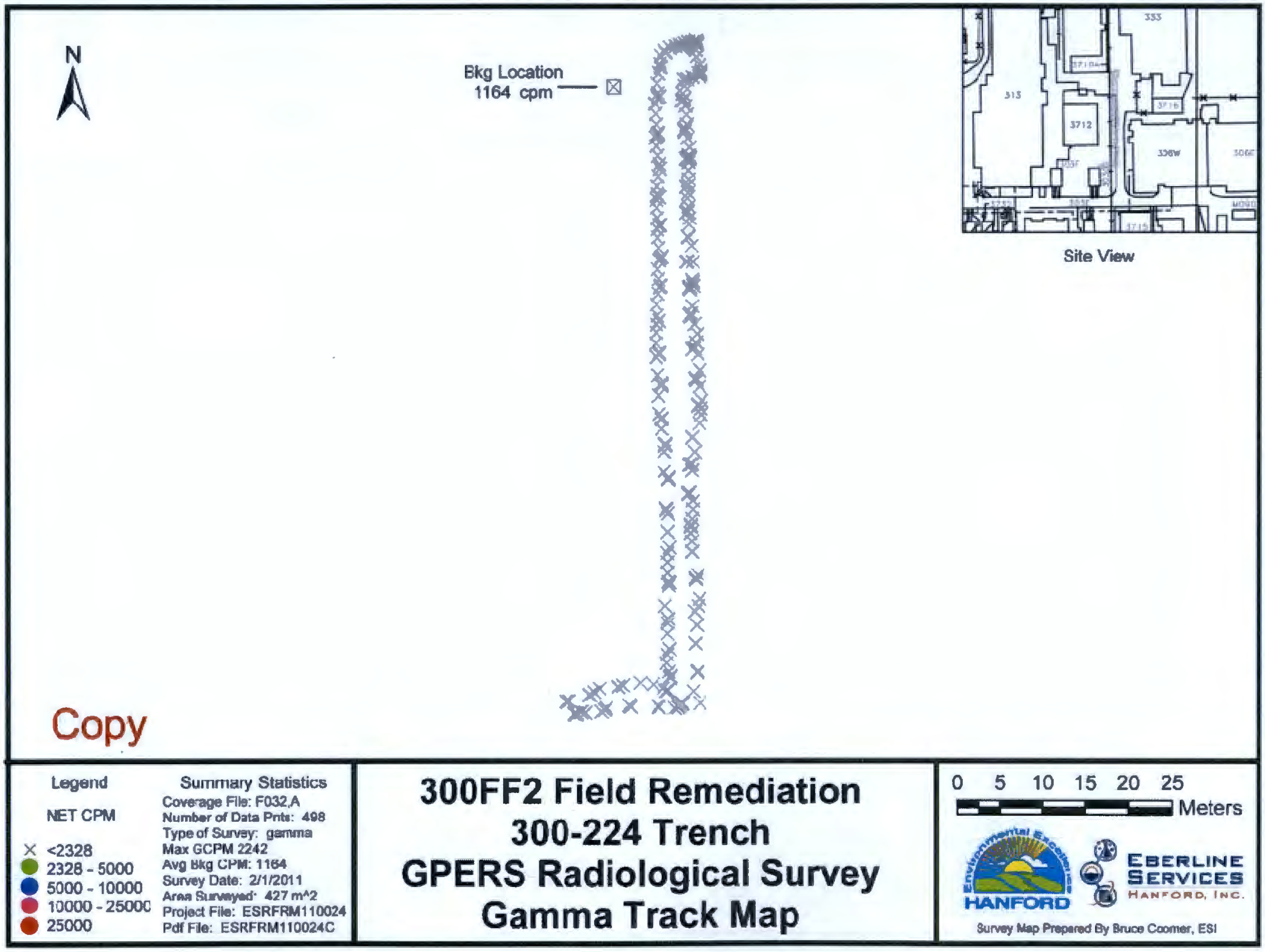
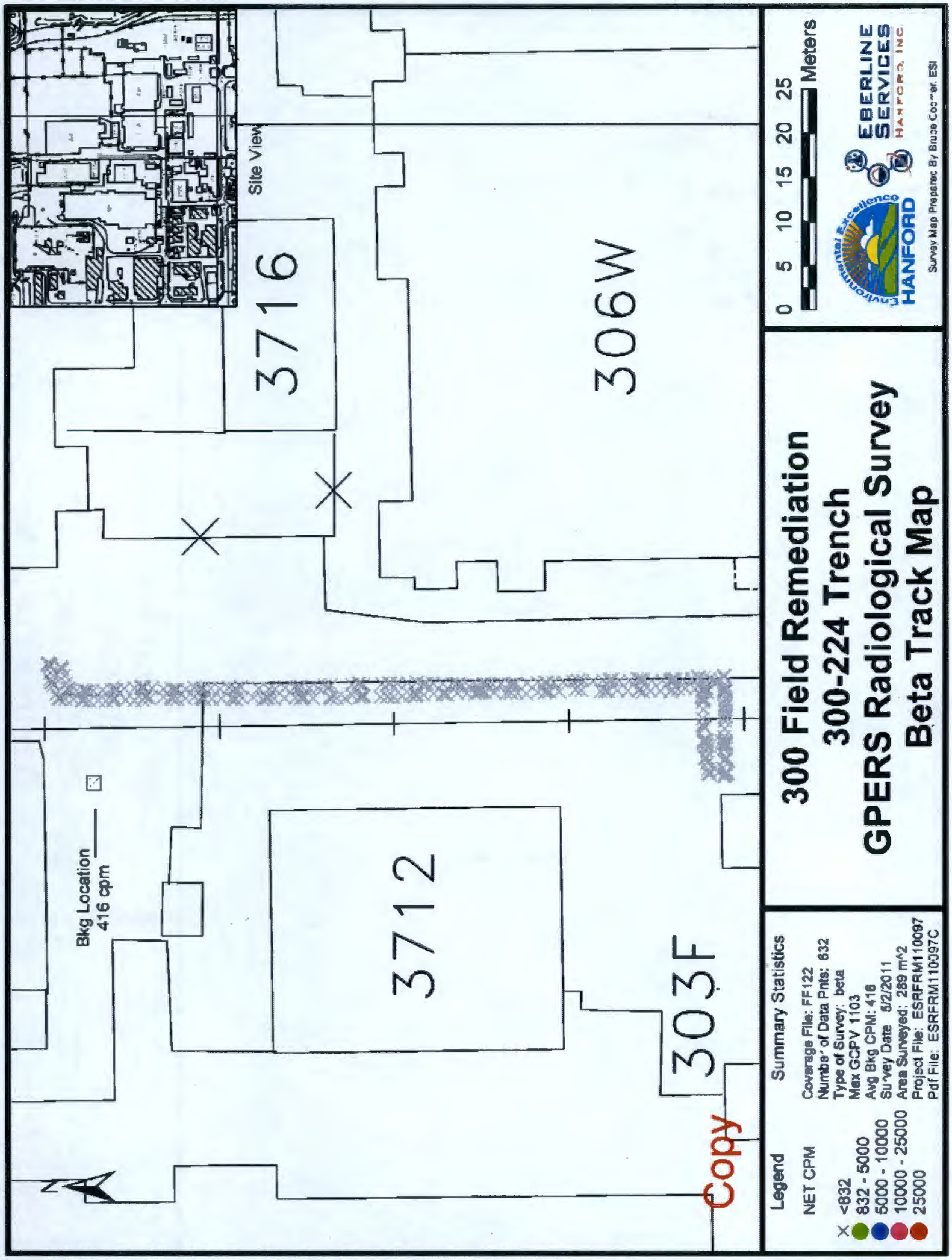


Figure 9. The 300-219 and 300-224 Waste Sites Gamma Track Map.

Figure 10. The 300-219 and 300-224 Waste Sites Beta Track Map.



On August 2, 2011, further radiological field screening for beta and gamma activity was conducted in the 300-219 and 300-224 waste site areas. These radiological field screening surveys did not indicate any significant residual radiological activity (Figures 11 and 12).

A post-excavation civil survey is included in Figure 13.

VERIFICATION SAMPLING ACTIVITIES

Verification sampling for the 300-219, 300-224, and 333 WSTF waste sites was conducted August 25, 2011, to support a determination that residual contaminant concentrations at these sites meet the cleanup criteria specified in the RDR/RAWP (DOE-RL 2009) and the 300-FF-2 ROD (EPA 2001). The verification sample results are provided in Appendix A and indicate that the waste removal action achieved compliance with the RAOs for the 300-219, 300-224, and 333 WSTF waste sites. The following subsections provide additional discussion of the information used to develop the verification sampling design. A more detailed discussion of the verification sampling can be found in the *Work Instruction for Verification Sampling of the 300-219, 300 Area Waste Acid Transfer Line; 300-224, WATS and U-Bearing Piping Trench; and 333 WSTF, West Side Tank Farm* (WCH 2011b).

The sampling locations are shown in Figure 14.

Contaminants of Potential Concern

COPCs for the 300-219, 300-224, and 333 WSTF waste sites are listed in the *Explanation of Significant Differences for the 300-FF-2 Operable Unit Interim Action Record of Decision* (EPA 2009), the 300-FF-2 ROD (EPA 2001, Table A-1), and WIDS, and are given in Table 1.

Figure 11. The Additional 300-219 and 300-224 Waste Sites Gamma Track Map.

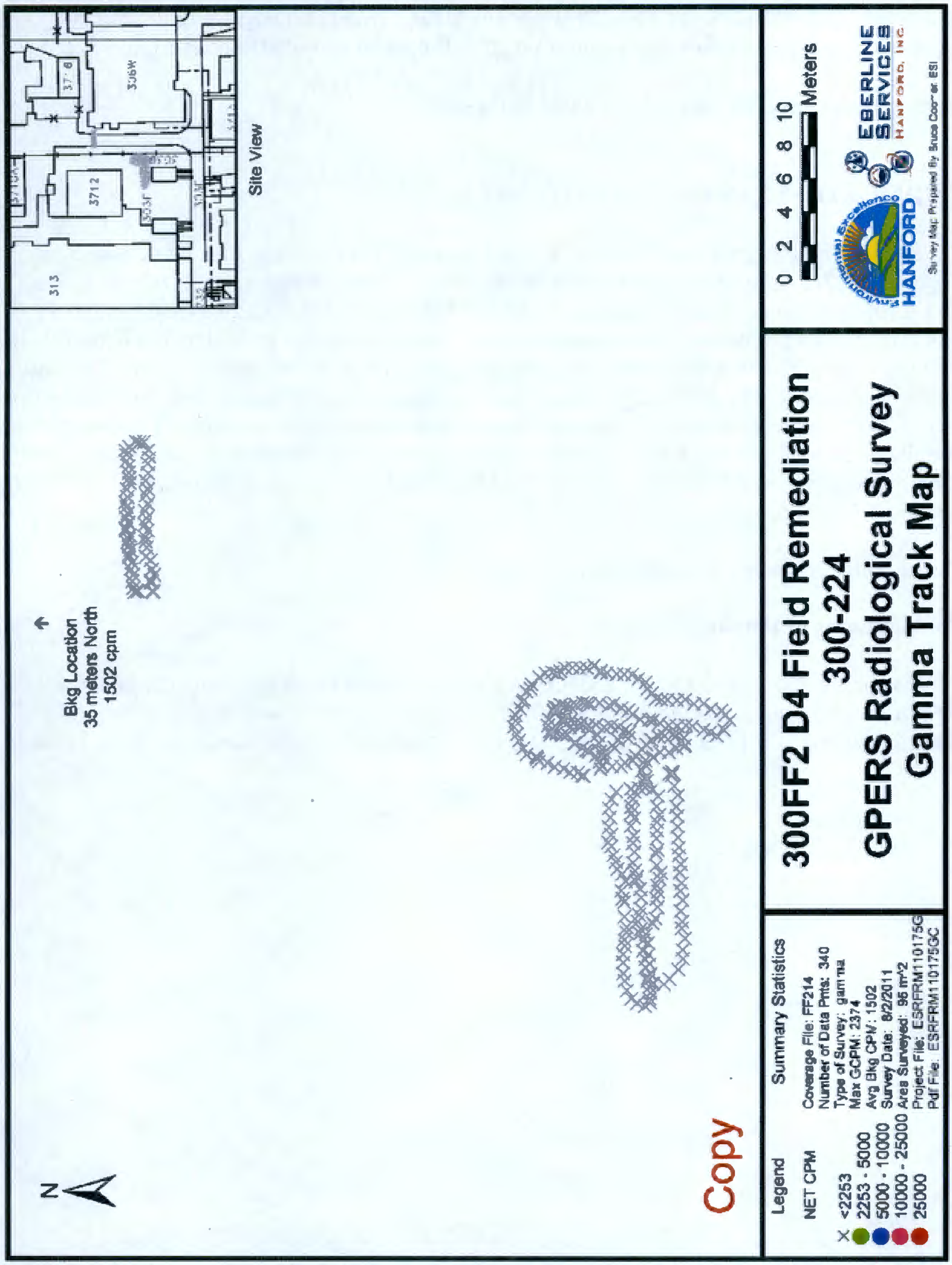


Figure 12. The Additional 300-219 and 300-224 Waste Sites Beta Track Map.

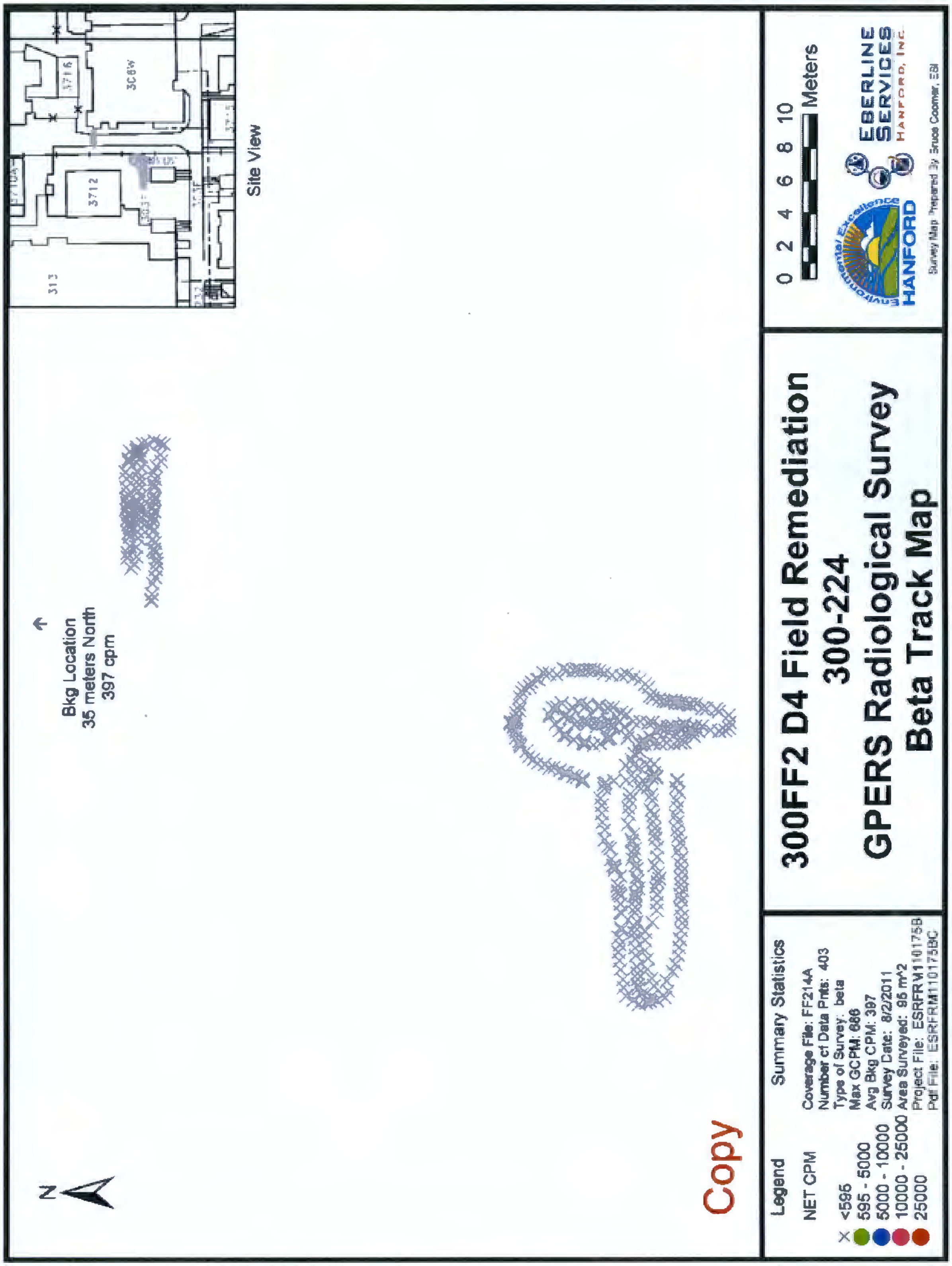


Figure 13. Post-Remediation Civil Survey for the 300-219, 300-224, and 333 WSTF Waste Sites.

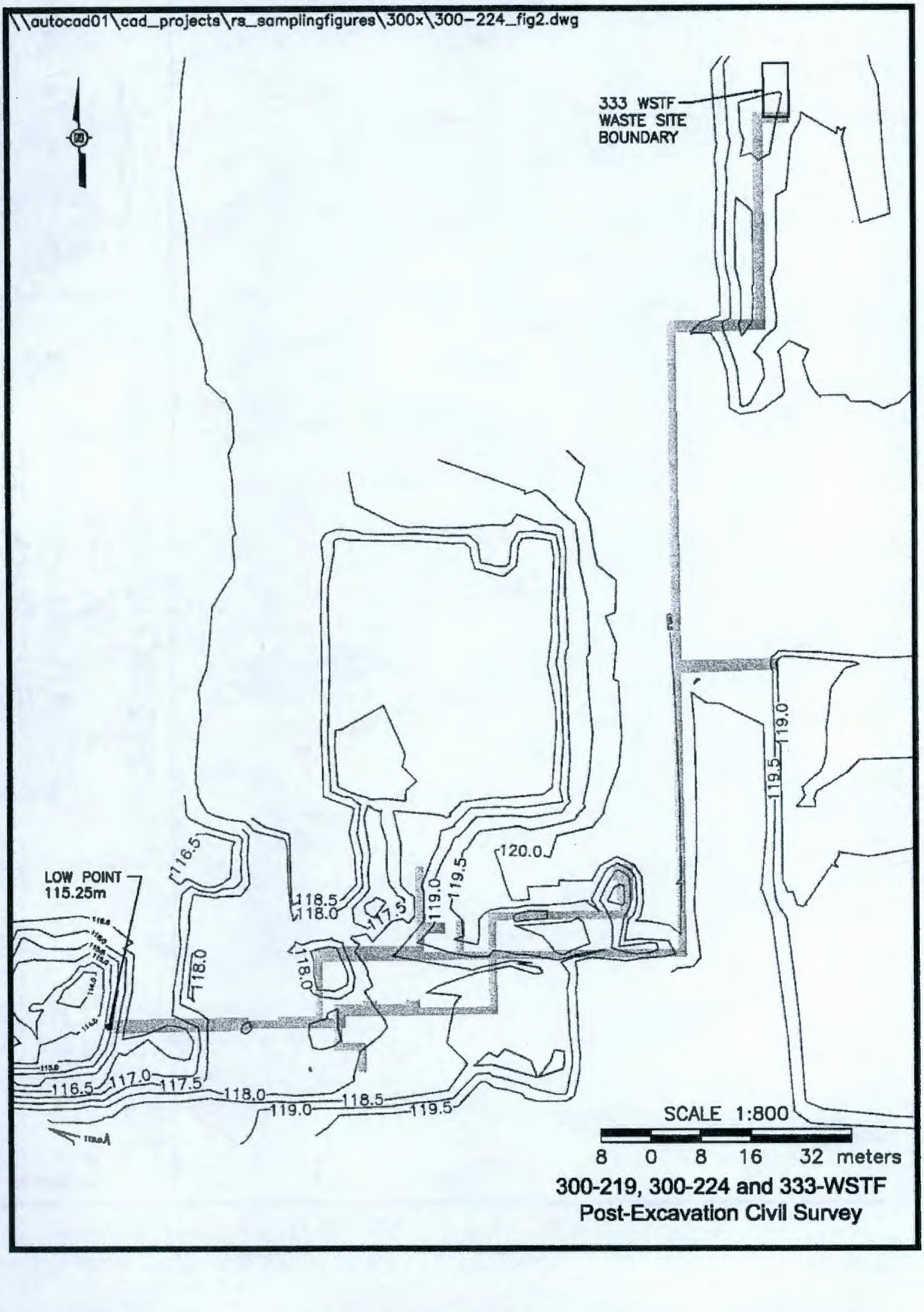


Figure 14. The 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Locations.

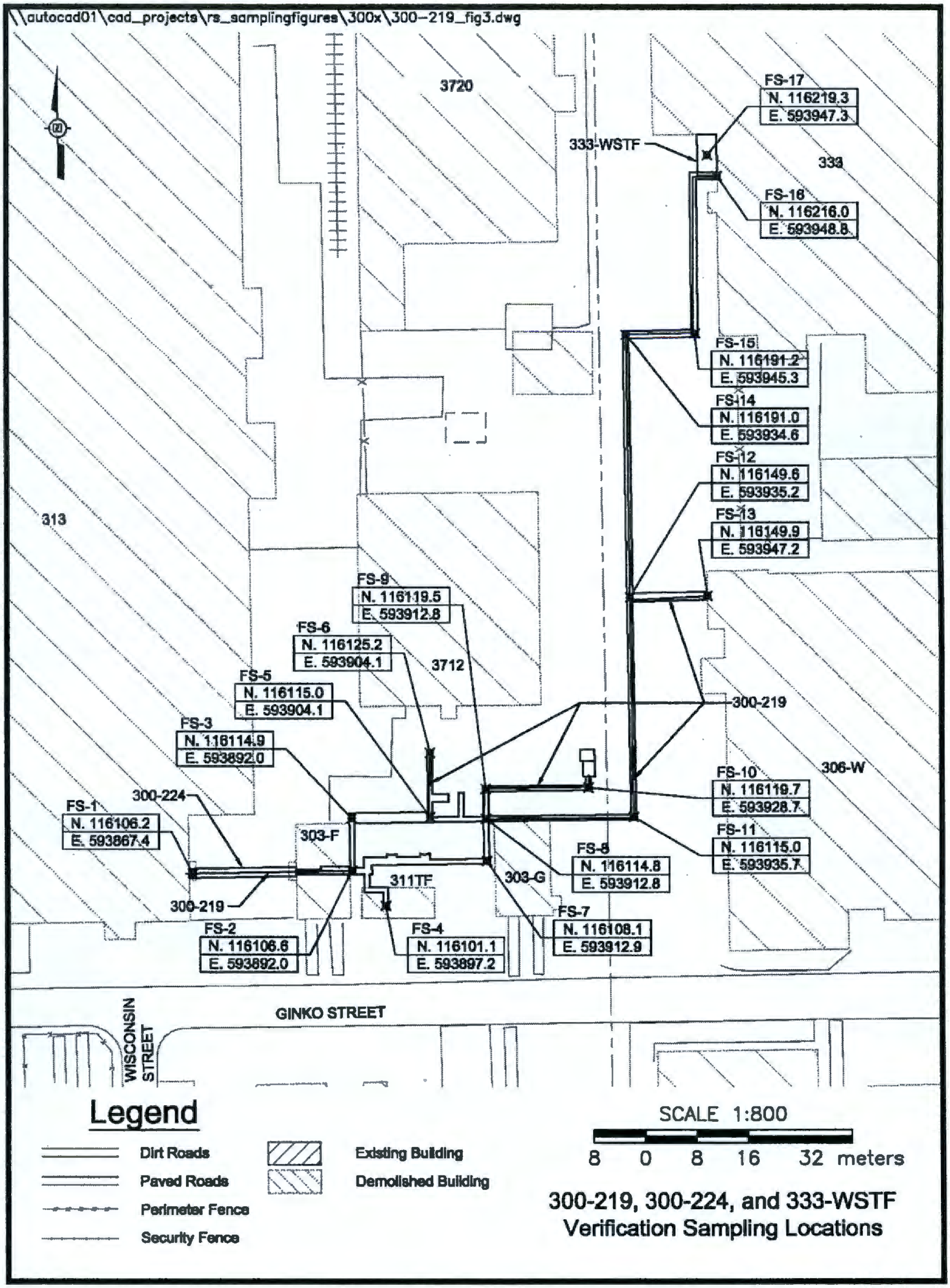


Table 1. Contaminants of Potential Concern for the 300-219, 300-224, and 333 WSTF Waste Sites.

Waste Site	Contaminant of Potential Concern	Reference
300-219	Radiological/hazardous contaminants	ESD 2009 (EPA 2009)
300-224	Uranium, acids (including nitric and sulfuric), caustics, petroleum products, tetrachloroethene, ethylene glycol, solvents	300-FF-2 ROD (EPA 2001)
333 WSTF	Uranium, acids, petroleum products	WIDS

EPA = U.S. Environmental Protection Agency

ESD = *Explanation of Significant Differences for the 300-FF-2 Operable Unit Interim Action Record of Decision Hanford Site Benton County, Washington*

ROD = *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Richland, Washington*

WIDS = Waste Information Data System

Based on a consideration of the COPCs listed in Table 1 and the process history of the sites, the required COPCs for verification sampling included the expanded list of inductively coupled plasma (ICP) metals, uranium-233/234, uranium-235, uranium-238, petroleum hydrocarbons, sulfate, and nitrate (WCH 2011b). In addition, the following potential COPCs were also included for analysis: volatile organic compounds, gamma-emitting radionuclides, alpha-emitting radionuclides, beta-emitting radionuclides, and mercury.

Cleanup verification samples were analyzed using EPA-approved analytical methods. Table 2 identifies the analyses for verification sampling.

Table 2. Laboratory Analytical Methods for the 300-219, 300-224, and 333 WSTF Waste Sites. (2 Pages)

Analytical Method	Contaminants of Potential Concern
ICP metals [a] – EPA method 6010	Metals
Mercury – EPA method 7471	Mercury
Isotopic uranium	Uranium-233/234, uranium-235, uranium-238
TPH – EPA Method 418.1	Petroleum hydrocarbons
IC anions [b] – EPA Method 300.0	Sulfate
NO_2/NO_3 [c] – EPA Method 353.2	Nitrogen in nitrate and nitrite
VOA – EPA Method 8260	Volatile organic compounds
GEA – gamma spectroscopy	Gamma-emitting radionuclides
Gross alpha – proportional counting	Alpha-emitting radionuclides
Gross beta – proportional counting	Beta-emitting radionuclides

Table 2. Laboratory Analytical Methods for the 300-219, 300-224, and 333 WSTF Waste Sites. (2 Pages)

Analytical Method	Contaminants of Potential Concern
pH – EPA method 9045 [d]	pH soil

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] Analysis was performed for the expanded list of IC anions to include bromide, chloride, fluoride, phosphate, and sulfate.
[c] To preclude holding time issues associated with EPA Method 300.0 for nitrites and nitrates, EPA Method 353.2 was performed.
[d] pH is not a regulated quantity, but is added to aid in the evaluation of the data.

EPA = U.S. Environmental Protection Agency
GEA = gamma energy analysis
IC = ion chromatography
ICP = inductively coupled plasma
TPH = total petroleum hydrocarbons
VOA = volatile organic analysis

Verification Sample Design

This section describes the basis for selection of a verification sampling design for the 300-219, 300-224, and 333 WSTF waste sites. The sampling was performed to verify that residual contaminant concentrations do not exceed soil cleanup levels for the protection of human health and the environment as established by the 300-FF-2 ROD (EPA 2001).

The 300 Area SAP (DOE-RL 2011a) recommends focused sampling to "the extent practicable" for waste sites listed in Tables 1-2 and 1-3 of that document. The 300-219, 300-224, and 333 WSTF waste sites are listed in the 300 Area SAP, Table 1-3 (DOE-RL 2011a). A focused sampling design was selected for the 300-219, 300-224, and 333 WSTF waste sites based primarily on endpoints and intersections of the pipelines.

Field quality control samples consisted of one equipment blank sample, one field duplicate sample, one split sample, and two trip blanks. All samples were submitted for full protocol laboratory analysis.

A map of the sample locations is provided in Figure 14, and a summary of verification samples collected for the 300-219, 300-224, and 333 WSTF waste sites is provided in Table 3.

Verification Sample Results

Seventeen focused soil samples were collected as described in the Verification Sample Design section. Statistical analysis (e.g., calculation of a 95% UCL value) is inappropriate for evaluation of focused samples; therefore, the results from each sample are evaluated using the maximum detected result for each COPC and comparing the value directly to the cleanup level. Table 4 provides a comparison of the maximum results from the seventeen focused samples against soil cleanup levels for direct exposure and groundwater and Columbia River protection. All individual focused sample results are provided in Appendix A.

Contaminants that were not detected by laboratory analysis are excluded from Table 4. Calculated cleanup levels for calcium, magnesium, potassium, silicon, and sodium are not

Table 3. The 300-219, 300-224, 333 WSTF Waste Sites August 25, 2011, Verification Sampling Summary Table.

Sample Location	HEIS Number	WSP Coordinates		Sample Analysis
		Northing (m)	Easting (m)	
FS-1	J1KRR9	116106.2	593867.4	ICP metals [a], isotopic uranium, TPH, IC anions [b], NO_2/NO_3 [c], VOA, GEA, gross alpha, gross beta, pH [d]
FS-2	J1KRR8	116106.6	593892.0	
FS-3	J1KRR6	116114.9	593892.0	
FS-4	J1KRR7	116101.1	593897.2	
FS-5	J1KRR5	116115.0	593904.1	
FS-6	J1KRR4	116125.2	593904.1	
FS-7	J1KRR2	116108.1	593912.9	
FS-8	J1KRR1	116114.8	593912.8	
FS-9	J1KRP9	116119.5	593912.8	
FS-10	J1KRR0	116119.7	593928.7	
FS-11	J1KRP8	116115.0	593935.7	
FS-12	J1KRP7	116149.6	593935.2	
FS-13	J1KRP6	116149.9	593947.2	
FS-14	J1KRP5	116191.0	593934.6	
FS-15	J1KRP4	116191.2	593945.3	
FS-16	J1KRP3	116216.0	593948.8	
FS-17	J1KRP2	116219.3	593947.3	
Split of FS-15	J1KTT9	116191.2	593945.3	
Duplicate of FS-7	J1KRR3	116108.1	593912.9	
Equipment blank	J1KRP1	NA	NA	ICP metals [a], mercury
Trip blanks	J1KTX5 J1KTX6	NA	NA	VOA

Source: Field logbook EL-1395-18 (WCH 2011a).

[a] Analyses were performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

[b] Analysis was performed for the expanded list of IC anions to include bromide, chloride, fluoride, phosphate, and sulfate.

[c] To preclude holding time issues associated with EPA Method 300.0 for nitrites and nitrates, EPA Method 353.2 was performed.

[d] pH is not a regulated quantity, but was added to aid in the evaluation of the data.

GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
TPH = total petroleum hydrocarbons
VOA = volatile organic analysis
WSP = Washington State Plane

Table 4. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 300-219, 300-224, and 333 WSTF Waste Site's Verification Samples. (2 Pages)

COPC	Maximum Result (pCi/g)	Industrial Soil Lookup Values [a] (pCi/g)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Protective of Groundwater	Protective of the River		
Uranium-233/234	38.8	167	127.4	127.4	No	--
Uranium-235	1.85	16	13.2	13.2	No	--
Uranium-238	37.2	167	127.4	127.4	No	--

Table 4. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 300-219, 300-224, and 333 WSTF Waste Site's Verification Samples. (2 Pages)

COPC	Maximum Result (mg/kg)	Soil Cleanup Levels [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Industrial Direct Exposure	Protective of Groundwater	Protective of the River		
Arsenic	3.8 (<BG)	58	20 [b]	20 [b]	No	--
Barium	91.1 (<BG)	4,900 [c]	200	400	No	--
Beryllium	0.56 (<BG)	104 [c]	1.51 [d]	1.51 [d]	No	--
Boron [e]	2.3	700,000	320	NA	No	--
Cadmium	0.36 (<BG)	139 [c]	0.81 [d]	0.81 [d]	No	--
Chromium (total)	25.6	5.25E+06	18.5 [d]	18.5 [d]	Yes	Yes [f]
Cobalt	10.6 (<BG)	1,050	15.7 [d]	NA	No	--
Copper	223	130,000	59.2	22.0 [d]	Yes	Yes [f]
Lead	26.4	1,000	NA [g]	NA [g]	No	--
Lithium	8.9 (<BG)	7,000	33.5 [d]	NA	No	--
Manganese	354 (<BG)	165,000	512 [d]	NA	No	--
Mercury	0.049 (<BG)	1,050	0.33 [d]	0.33 [d]	No	--
Molybdenum [e]	0.42	17,500	8	NA	No	--
Nickel	13.5 (<BG)	70,000	19.1 [d]	27.4	No	--
Uranium (total)	37.0	505	53	106	No	--
Vanadium	65.7 (<BG)	24,500	85.1 [d]	NA	No	--
Zinc	175	1.05E+06	480	67.8 [d]	No	Yes [f]
Chloride	48.0 (<BG)	NA	25,000	NA	No	--
Flouride	94.0	210,000	96	400	No	--
Nitrogen in Nitrate	8.6 (<BG)	5.60E+06	1,000	2,000	No	--
Sulfate	163 (<BG)	NA	25,000	NA	No	--
TPH – diesel range ext	140	200	200	200	No	--
1,1-Dichloroethene	0.002	3.5E+05	0.0073	NA	No	--
methyl ethyl ketone (2-butanone)	0.0048	2.1E+6	480	NA	No	--
Acetone	0.045	3.15E+06	720	NA	No	--
Methylene chloride	0.0065	17,500	0.5	0.94	No	--
Toluene	0.001	28,000	64	1,360	No	--

[a] Lookup values and RAGs obtained from the RDR/RAWP (DOE-RL 2009) as amended by Tri-Party Agreement Change Notice TPA-CN-407 (DOE-RL 2010b) unless otherwise noted.

[b] The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers.

[c] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3]) (Ecology 1996) using an airborne particulate mass-loading rate of 0.0001 g/m^3 (WDOH 1997).

[d] Where cleanup levels are less than background cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 1996).

[e] No Hanford Site-specific or Washington State background value available.

[f] Based on RESRAD modeling using input parameters and soil-partitioning coefficients from the RDR/RAWP (DOE-RL 2009) for an industrial exposure scenario, residual concentrations of total chromium, copper, and zinc are not expected to migrate vertically in 1,000 years (based on the contaminant with the lowest distribution coefficient [copper] of 22 mL/g). The vadose zone underlying the soil below the site is approximately 9 m (30 ft) thick based on an elevation at maximum excavation depth of 115 m (377 ft) and a groundwater elevation of approximately 106 m (348 ft) (*Hanford Site Groundwater Monitoring and Performance Report for 2009 Volumes 1 & 2* [DOE-RL 2010a]). Therefore, residual concentrations of total chromium, copper, and zinc are predicted to be protective of groundwater and the Columbia River.

[g] The RESRAD model predicts that lead will not reach groundwater within 1,000 years based on a generic site profile (4.6-m [15-ft] contaminated zone and 6-m [19.6-ft] uncontaminated zone). Anomalous lead concentrations will be assessed at the time of final waste site closeout to verify protection of groundwater and river pathways (EPA 2004). See Tri-Party Agreement Change Notice TPA-CN-407 (DOE-RL 2010b).

--	= not applicable	RDR/RAWP	= *Remedial Design Report/Remedial Action Work Plan for the 300 Area*
BG	= background	RESRAD	= RESidual RADioactivity (dose model)
COPC	= contaminant of potential concern	TPH	= total petroleum hydrocarbons
NA	= not applicable	WAC	= *Washington Administrative Code*
RAG	= remedial action goal		

presented in the RDR/RAWP (DOE-RL 2009). Parameters to calculate cleanup levels for these constituents are not presented in the Cleanup Levels and Risk Calculations (CLARC) Database (Ecology 2011) under WAC 173-340-740(3) or other reference databases. The EPA's *Risk Assessment Guidance for Superfund* (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included in these tables. The laboratory-reported data results for all constituents are stored in the Environmental Restoration (ENRE) project-specific database prior to provision to the Hanford Environmental Information System (HEIS) and are presented as an attachment to the relative percent difference (RPD) and direct contact hazard quotient calculation in Appendix A.

DATA EVALUATION

This section demonstrates that contaminant concentrations at the 300-219, 300-224, and 333 WSTF waste sites achieve the applicable RAGs developed to support industrial land use in the 300 Area as established in the 300-FF-2 ROD (EPA 2001) and documented in the RDR/RAWP (DOE-RL 2009). Table 4 compares the cleanup verification focused sample results to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River.

Nonradionuclide Direct Contact Hazard Quotient and Carcinogenic Risk RAGs Attained

Nonradionuclide risk requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. For the 300-219, 300-224, and 333 WSTF waste sites, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background levels. The individual and cumulative hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detected levels is 7.6×10^{-2}. Excess cancer risk values for individual nonradionuclide constituents are less than 1×10^{-6}. The total carcinogenic risk value for the carcinogenic constituents above background or detected levels is 9.5×10^{-12}, which is less than the criteria of 1×10^{-5}.

Nonradionuclide Soil RAGs for Groundwater and River Protection Attained

All focused sample results listed in Table 4 from verification sampling at the 300-219, 300-224, and 333 WSTF waste sites are below soil RAGs, except for soil cleanup levels protective of groundwater and the Columbia River for total chromium and copper, and the river protection cleanup level for zinc. Data were not collected on the vertical extent of these contaminants, but based on RESidual RADioactivity (RESRAD) input parameters and soil-partitioning coefficients from the RDR/RAWP (DOE-RL 2009) for an industrial exposure scenario, residual concentrations of these contaminants are not expected to migrate vertically in 1,000 years based on copper, the contaminant with the lowest distribution coefficient (K_d), with a value of 22 mL/g. The vadose zone underlying the soil below the site is approximately 9 m (30 ft) thick based on an elevation at maximum excavation depth of 115 m (377 ft) and a groundwater elevation of approximately 106 m (348 ft) (DOE-RL 2010a). Therefore, residual concentrations of these contaminants are predicted to be protective of groundwater and the Columbia River.

Radionuclides

Table 5 compares the radionuclide cleanup verification results above background for the 300-219, 300-224, and 333 WSTF waste sites to direct exposure single radionuclide 15 mrem/yr dose-equivalence values and shows the sum of fractions evaluations. The columns on the left side of the table are the COPCs and the radionuclide activities for the samples, corrected for background, as appropriate. The third column presents the single radionuclide 15 mrem/yr dose-equivalence activity, and the last column presents the maximum values divided by the dose-equivalence activity. As demonstrated by the summation of these fractions, the cumulative dose contributed by residual radionuclide populations will be less than the 15 mrem/yr criterion.

Table 5. Attainment of Radionuclide Industrial Direct Exposure Remedial Action Goal.

Contaminants of Potential Concern	Maximum Values Above Background[a] (pCi/g)	Activity Equivalent to 15 mrem/yr Industrial Dose[b] (pCi/g)	Fraction
Uranium-233/234	37.7	167	0.226
Uranium-235	1.74	16	0.109
Uranium-238	36.1	167	0.216
		Total	0.551
		Equivalent Dose (mrem/yr)	8.3

[a] Hanford Site background values for uranium-233/234 (1.1 pCi/g), uranium-235 (0.11 pCi/g), and uranium-238 (1.1 pCi/g) (*Hanford Site Background: Part 2, Soil Background for Radionuclides* [DOE-RL 1996]) have been subtracted from the maximum values.

[b] Single radionuclide 15 mrem/yr dose-equivalence values and derivation methodology are presented in the *Remedial Design Report/Remedial Action Work Plan for the 300 Area* (DOE-RL 2009, Table D-5).

In addition, gross alpha and gross beta screening analyses were performed to evaluate if additional isotopic analysis was required. The conclusion was that it would not yield potentially useful data (Weiss 2011).

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach (WCH 2011b), the field logbook (WCH 2011a), and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications.

The DQA for the 300-219, 300-224, and 333 WSTF waste sites established that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The cleanup verification sample analytical data are stored in the ENRE project-specific database for data evaluation prior to archival in the HEIS and are provided as an attachment to the RPD and direct contact hazard quotient calculation in Appendix A. The detailed DQA is presented in Appendix B.

SUMMARY FOR INTERIM CLOSURE

The 300-219, 300-224, and 333 WSTF waste sites have been evaluated in accordance with the 300-FF-2 ROD (EPA 2001) and the RDR/RAWP (DOE-RL 2009). Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAGs and corresponding RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 300-219, 300-224, and 333 WSTF waste sites to Interim Closed Out. These results show that residual soil concentrations support future land uses that can be represented (or bounded) by an industrial land-use scenario and are protective of groundwater and the Columbia River. The 300-219, 300-224, and 333 WSTF waste sites do not meet the RAGs and RAOs for unrestricted land use; therefore, institutional controls to maintain industrial land use of the site are required.

REFERENCES

40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations*, as amended.

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APPENDIX A

RELATIVE PERCENT DIFFERENCE (RPD), DIRECT CONTACT HAZARD QUOTIENT, AND CARCINOGENIC RISK CALCULATIONS

APPENDIX A

CALCULATION BRIEF

The calculations in this appendix are kept in the active Washington Closure Hanford project files and are available upon request. When the project is completed, the file will be stored in a U.S. Department of Energy, Richland Operations Office repository. This calculation has been prepared in accordance with ENG-1, *Engineering Services*, ENG-1-4.5, "Project Calculation," Washington Closure Hanford, Richland, Washington. The following calculations are provided in this appendix:

300-219/300-224/333 WSTF RPD and Direct Contact Hazard Quotient and Carcinogenic Risk Calculation, 0300X-CA-V0145, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS
The calculations that are provided in this appendix have been generated to document compliance with established cleanup levels. These calculations should be used in conjunction with other relevant documents in the administrative record.

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 300 Area Field Remediation **Job No. 14655**

Area: 300 Area Remaining Site

Discipline: Environmental Calculation No: 0300X-CA-V0145

Subject: 300-219, 300-224, and 333 WSTF Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculation

Computer Program: Excel Program No: Excel 2003

The attached calculations have been generated to document compliance with established cleanup levels. These calculations should be used in conjunction with other relevant documents in the administrative record.

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Summary = 7 Attachment 1 = 12 Total = 20	N. K. Schiffern N.K. Schiffern	I. B. Berezovskiy IBerezovskiy	J.D. Skoglie [signature]	J. Ludowise [signature]	1-16-2012

SUMMARY OF REVISION

WCH-DE-018 (05/08/2007)

DE01-437.03

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern	Date:	10/31/2011	Calc. No.:	0300X-CA-V0145	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/31/2011
Subject:	300-219, 300-224, and 333 WSTF Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 7	

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 300-219, 300-224, and 333 WSTF waste sites. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009), the following criteria must be met:

1) An HQ of <1.0 for all individual noncarcinogens
2) A cumulative HQ of <1.0 for noncarcinogens
3) An excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.

Also, calculate the relative percent difference (RPD) for primary-duplicate sample pairs from 300-219, 300-224, and 333 WSTF waste sites verification sampling, as necessary.

GIVEN/REFERENCES:

1) DOE-RL, 2009, *Remedial Design Report/Remedial Action Work Plan for the 300 Area,* DOE/RL-2001-47, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

2) DOE-RL, 2011, *300 Area Remedial Action Sampling and Analysis Plan,* DOE/RL-2001-48, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

3) EPA, 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94/013, U.S. Environmental Protection Agency, Washington, D.C.

4) WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, 1996.

5) WCH, 2011, *Remaining Sites Verification Package for the 300-219, 300 Area Waste Acid Transfer Line; 300-224, WATS and U-Bearing Piping Trench; 333 WSTF, West Side Tank Farm,* Attachment to Waste Site Reclassification Form 2011-106, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

1) Generate an HQ for each noncarcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the individual HQ of <1.0 (DOE-RL 2009).

2) Sum the HQs and compare this value to the cumulative HQ of <1.0.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern *n.s.*	Date:	10/31/2011	Calc. No.:	0300X-CA-V0145	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/31/2011
Subject:	300-219, 300-224, and 333 WSTF Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 7	

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the excess cancer risk of <1 x 10^{-6} (DOE-RL 2009).

4) Sum the excess cancer risk value(s) and compare it to the cumulative cancer risk of <1 x 10^{-5}.

5) Use data from WCH (2011) to perform the RPD calculations for primary-duplicate sample pairs, as required.

METHODOLOGY:

The 300-219, 300-224, and 333 WSTF waste sites underwent focused sampling at seventeen locations for the purpose of verification sampling. One duplicate and one split samples were collected. The direct contact hazard quotient and carcinogenic risk calculations for the 300-219, 300-224, and 333 WSTF waste sites were conservatively calculated for the entire waste sites using the greatest of the maximum soil sample results (WCH 2011). Of the contaminants of potential concern (COPCs) for this site, chromium, copper, fluoride, uranium, and zinc require HQ and risk calculations because these analytes were detected above the background values. Boron, molybdenum, and volatile organics require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Lead was detected above background; however, lead does not have a reference dose for calculation of a hazard quotient because toxic effects of lead are correlated with blood-based level rather than exposure level or daily intake. Although total petroleum hydrocarbons (diesel range extended) were detected and no background value is available, the risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation. All other site nonradionuclide COPCs were not detected or were quantified below background levels. Due to an exceedance of the residential carcinogenic risk criteria for uranium-238, the entire data set was evaluated against the industrial HQ and risk standard. An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron is 2.3 mg/kg, divided by the noncarcinogenic RAG value of 700,000 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 3.3 x 10^{-6}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation. The sum of the HQ values is 7.6 x 10^{-2}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum or statistical value is divided by the carcinogenic RAG value, then multiplied by 1.0 x 10^{-6}. For example, the maximum value for methylenechloride is 0.0065 mg/kg; divided by 17,500 mg/kg, and multiplied as indicated, is 3.7 x 10^{-13}. Comparing this value to the requirement of <1 x 10^{-6}, this criterion is met.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern *n.s.*	Date:	10/31/2011	Calc. No.:	0300X-CA-V0145	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/31/2011
Subject:	300-219, 300-224, and 333 WSTF Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 7	

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk is obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation. The sum of the excess cancer risk values is 9.5×10^{-12}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

5) The RPD is calculated when both the primary value and the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method and is listed for certain analytes in Table II-1 of the SAP (DOE-RL 2011). Other analytes will have their own pre-determined constituents and will have their own TDLs based on the laboratory and method used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

$$RPD = [\ |M-D|/((M+D)/2)]*100$$

where, M = main sample value D = duplicate sample value

When an analyte is detected in the primary or duplicate sample, but was quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate results exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. This assessment is provided in the data quality assessment section of the RSVP.

For quality assurance/quality control (QA/QC) duplicate RPD calculations, a value less than 30% indicates the data compare favorably. For regulatory splits, a threshold of 35% is used (EPA 1994). If the RPD is greater than 30% (or 35% for regulatory split data), further investigation regarding the usability of the data is performed. No split samples were collected for cleanup verification of the subject site. Additional discussion is provided in the data quality assessment section of the applicable RSVP (WCH 2011), as necessary.

RESULTS:

1) List individual noncarcinogens and corresponding HQs >1.0: None
2) List the cumulative noncarcinogenic HQ >1.0: None
3) List individual carcinogens and corresponding excess cancer risk $>1 \times 10^{-6}$: None
4) List the cumulative excess cancer risk for carcinogens $>1 \times 10^{-5}$: None

Table 1 shows the results of the residential direct contact calculations.

5) The evaluation of the QA/QC duplicate RPD calculations are performed within the data quality assessment section of the RSVP.

Table 2 and 3 show the results of the RPD calculations for the 300-219, 300-224, and 333 WSTF waste sites.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern	Date:	11/14/2011	Calc. No.:	0300X-CA-V0145	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	11/14/2011
Subject:	300-219, 300-224, and 333 WSTF Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 4 of 7	

Table 1. Industrial Direct Contact HQ and Excess Cancer Risk Results for the 300-219, 300-224, and 333 WSTF waste sites.

Contaminants of Potential Concern	Maximum Value[a] (mg/kg)	Industrial Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Industrial Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.3	700,000	3.3E-06	--	--
Chromium, total	25.6	5,250,000	4.9E-06	--	--
Copper	223	130,000	1.7E-03	--	--
Lead	26.4	1,000	--	--	--
Molybdenum	0.42	17,500	2.4E-05	--	--
Uranium	37.0	505	7.3E-02	--	--
Zinc	175	1,050,000	1.7E-04	--	--
Anions					
Fluoride	94.0	210,000	4.5E-04	--	--
Total Petroleum Hydrocarbons					
Diesel range EXT[c]	140	200	--	--	--
Volatiles					
1,1-Dichloroethene	0.0020	175,000	1.1E-08	219	9.1E-12
2-Butanone	0.0048	2,100,000	2.3E-09	--	--
Acetone	0.045	3,150,000	1.4E-08	--	--
Methylenechloride	0.0065	210,000	3.1E-08	17,500	3.7E-13
Toluene	0.0010	28,000	3.6E-08	--	--
Totals					
Cumulative Hazard Quotient:			**7.6E-02**		
Cumulative Excess Cancer Risk:					**9.5E-12**

Notes:

[a] = From WCH (2011).

[b] = Value obtained from the RDR/RAWP (DOE-RL 2009) or *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

[c] = The risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation.

-- = not applicable

RAG = remedial action goal

Table 2. Relative Percent Difference Calculations for the 300-219, 300-224, and 333 WSTF waste sites. (3 pages)

Sampling Area	HEIS Number	Sample Date	Radium-226			Radium-228			Uranium-238 GEA			Gross alpha		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	PQL
FS-7	J1KRR2	8/25/2011	0.480		0.0529	0.619		0.121	0.473		0.0589	7.83		4.70
Duplicate of J1KRR2	J1KRR3	8/25/2011	0.469		0.0624	0.730		0.149	0.492		0.0612	8.37		3.92

Analysis:

TDL		0.1	0.2	1	10
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD				
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern NKS	Date:	10/31/2011	Calc. No.:	0300X-CA-V0145	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/31/2011
Subject:	300-219, 300-224, and 333 WSTF Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 5 of 7	

Table 2. Relative Percent Difference Calculations for the 300-219, 300-224, and 333 WSTF waste sites. (3 pages)

Sampling	HEIS	Sample	Gross beta			Uranium-234			Aluminum			Arsenic		
Area	Number	Date	pCi/g	Q	PQL	pCi/g	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	25.4		4.77	0.546		0.171	7480	X	1.5	3.8		0.64
Duplicate of J1KRR2	J1KRR3	8/25/2011	23.9		4.54	0.739		0.126	7760	X	1.7	2.2		0.74

Analysis:

		Gross beta	Uranium-234	Aluminum	Arsenic
TDL		15	1	5	10
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD			3.7%	
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable

Sampling	HEIS	Sample	Barium			Beryllium			Cadmium			Calcium		
Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	77.5	X	0.073	0.39		0.032	0.065	B	0.039	3360	X	13.6
Duplicate of J1KRR2	J1KRR3	8/25/2011	79.9	X	0.085	0.39		0.037	0.064	B	0.046	3460	X	15.8

Analysis:

		Barium	Beryllium	Cadmium	Calcium
TDL		2	0.5	0.5	100
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	3.0%			2.9%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable

Sampling	HEIS	Sample	Chromium			Cobalt			Copper			Iron		
Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	9.1	X	0.056	8.0		0.096	13.9		0.21	21400	X	3.7
Duplicate of J1KRR2	J1KRR3	8/25/2011	10	X	0.065	7.4		0.11	12.9		0.24	22000	X	4.3

Analysis:

		Chromium	Cobalt	Copper	Iron
TDL		1	2	1	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD	9.4%		7.5%	2.8%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable

Sampling	HEIS	Sample	Lead			Lithium			Magnesium			Manganese		
Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	5.6		0.26	7.3		0.29	4280	X	3.6	353	X	0.096
Duplicate of J1KRR2	J1KRR3	8/25/2011	4.1		0.30	7.9		0.34	4590	X	4.2	354	X	0.11

Analysis:

		Lead	Lithium	Magnesium	Manganese
TDL		5	2.5	75	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD			7.0%	0.3%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable

Sampling	HEIS	Sample	Nickel			Potassium			Silicon			Sodium		
Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	9.5	X	0.12	1600		39.5	267		5.4	500		56.8
Duplicate of J1KRR2	J1KRR3	8/25/2011	10.7	X	0.14	1660		46.0	299		6.4	504		66.3

Analysis:

		Nickel	Potassium	Silicon	Sodium
TDL		4	400	2	50
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD			11.3%	0.8%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable

Sampling	HEIS	Sample	Uranium			Vanadium			Zinc			Zirconium		
Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	0.95		0.0015	42.0		0.091	41.4	X	0.38	18.8	X	0.34
Duplicate of J1KRR2	J1KRR3	8/25/2011	0.85		0.0018	44.5		0.11	42.5	X	0.45	19.7	X	0.40

Analysis:

		Uranium	Vanadium	Zinc	Zirconium
TDL		1	2.5	1	2.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD		5.8%	2.6%	4.7%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable

Table 2. Relative Percent Difference Calculations for the 300-219, 300-224, and 333 WSTF waste sites. (3 pages)

Sampling	HEIS	Sample	TPH - diesel range			TPH - diesel range EXT			Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate		
Area	Number	Date	ug/kg	Q	PQL	ug/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	840	J	650	1000	J	960	0.55	B	0.31	0.61	B	0.30
Duplicate of J1KRR2	J1KRR3	8/25/2011	940	J	780	1400	J	1100	0.54	B	0.37	0.40	B	0.36

Analysis:

TDL		5000	5000	2.5	2.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD				
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Sampling	HEIS	Sample	Sulfate			Acetone		
Area	Number	Date	mg/kg	Q	PQL	ug/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	4.7	B	1.7	29		7.6
Duplicate of J1KRR2	J1KRR3	8/25/2011	6.8		2.0	15	J	8.8

Analysis:

TDL		5	10
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		
	Difference > 2 TDL?	No - acceptable	No - acceptable

Table 3. Relative Percent Difference Calculations for the 300-219, 300-224, and 333 WSTF waste sites - Split Analysis (2 pages)

Sampling	HEIS	Sample	Radium-226			Gross alpha			Gross beta			Uranium-238		
Area	Number	Date	pCi/g	Q	MDA	pCi/g	Q	PQL	pCi/g	Q	PQL	pCi/g	Q	PQL
FS-15	J1KRP4	8/25/2011	0.408		0.0559	8.60		4.69	29.3		4.48	0.832		0.120
SPLIT of J1KRP4	J1KTT9	8/25/2011	0.392		0.0290	6.72		3.89	19.0		4.92	0.787		0.223

Analysis:

TDL		0.1	10	15	1
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD				
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Sampling	HEIS	Sample	Aluminum			Arsenic			Barium			Beryllium		
Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-15	J1KRP4	8/25/2011	6860	X	1.4	1.9		0.61	78.5	X	0.071	0.37		0.031
SPLIT of J1KRP4	J1KTT9	8/25/2011	5480		3.80	2.38		0.761	71.5		0.380	0.249		0.152

Analysis:

TDL		5	10	2	0.5
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	22.4%		9.3%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable

Sampling	HEIS	Sample	Boron			Cadmium			Calcium			Chromium		
Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-15	J1KRP4	8/25/2011	1.0	B	0.91	0.098	B	0.038	3470	X	13.1	8.9	X	0.054
SPLIT of J1KRP4	J1KTT9	8/25/2011	1.02	B	1.52	0.0752	B	0.152	2780		76.1	9.37		0.152

Analysis:

TDL		2	0.5	100	1
Split Analysis	Both > PQL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?			Yes (calc RPD)	Yes (calc RPD)
	RPD			22.1%	5.1%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern	Date:	10/31/2011	Calc. No.:	0300X-CA-V0145	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/31/2011
Subject:	300-219, 300-224, and 333 WSTF Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 7 of 7	

Table 3. Relative Percent Difference Calculations for the 300-219, 300-224, and 333 WSTF waste sites - Split Analysis (2 pages)

Sampling Area	HEIS Number	Sample Date	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL
FS-15	J1KRP4	8/25/2011	6.7		0.093	12.0		0.20	21200	X	3.5	4.1		0.25
SPLIT of J1KRP4	J1KTT9	8/25/2011	5.69		1.52	9.62		0.761	16900		15.2	3.09		0.380

Analysis:

		Cobalt	Copper	Iron	Lead
TDL		2	1	5	5
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		22.0%	22.6%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Lithium mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Nickel mg/kg	Q	PQL
FS-15	J1KRP4	8/25/2011	7.2		0.28	4080	X	3.4	325	X	0.093	9.1	X	0.11
SPLIT of J1KRP4	J1KTT9	8/25/2011	6.86		1.90	3860		57.1	247		3.80	8.64		3.04

Analysis:

		Lithium	Magnesium	Manganese	Nickel
TDL		2.5	75	5	4
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		5.5%	27.3%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL
FS-15	J1KRP4	8/25/2011	1420		38.1	243		5.3	264		54.8	44.9		0.087
SPLIT of J1KRP4	J1KTT9	8/25/2011	1160		304	367		1.52	218		38.0	44.0		1.90

Analysis:

		Potassium	Silicon	Sodium	Vanadium
TDL		400	2	50	2.5
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD		40.7%		2.0%
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable

Sampling Area	HEIS Number	Sample Date	Zinc mg/kg	Q	PQL	Zirconium mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL
FS-15	J1KRP4	8/25/2011	41.9	X	0.37	19.2	X	0.33	0.67	B	0.30
SPLIT of J1KRP4	J1KTT9	8/25/2011	37.5		7.61	15.7		1.90	0.51		0.50

Analysis:

		Zinc	Zirconium	Nitrogen in Nitrite and Nitrate
TDL		1	2.5	2.5
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	11.1%	20.1%	
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable

CONCLUSION:

The calculations in Tables 1 demonstrates that the 300-219, 300-224, and 333 WSTF waste sites meet the requirements for the industrial direct contact hazard quotients and carcinogenic (excess cancer) risk and RPDs, respectively, as identified in the RDR/RAWP (DOE-RL 2009). The hazard quotients and carcinogenic (excess cancer) risk and RPD calculations are for use in the RSVP for this site.

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results (Radionuclides)

Sample Location	HEIS Number	Sample Date	Americium-241			Antimony-125			Bismuth-214			Cerium-144			Cesium-134			Cesium-137			Cobalt-60		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
FS-7	J1KRR2	8/25/2011	-0.0155	U	0.288	0.0188	U	0.0761				-0.0594	U	0.169	0.0300	U	0.0382	0.0112	U	0.0327	-0.0162	U	0.0325
Duplicate of J1KRR2	J1KRR3	8/25/2011	-0.00116	U	0.0608	0.0430	U	0.0865				-0.0917	U	0.172	0.0185	U	0.0407	-0.00373	U	0.0352	0.000534	U	0.0375
FS-15	J1KRP4	8/25/2011	-0.0646	U	0.151	0.0461	U	0.0838				-0.113	U	0.201	0.0295	U	0.0407	0.00690	U	0.0313	-0.00231	U	0.0341
SPLIT of J1KRP4	J1KTT9	8/25/2011	0.0250	U	0.0250	0.0330	U	0.0330	0.404		0.0290	0.0820	U	0.0820	0.0230	U	0.0230	0.0150	U	0.0150	0.0180	U	0.0180
FS-1	J1KRR9	8/25/2011	0.00926	U	0.0809	0.00297	U	0.0849				-0.0383	U	0.192	0.0331	U	0.0434	-0.00379	U	0.0345	-0.00279	U	0.0322
FS-2	J1KRR8	8/25/2011	0.0662	U	0.163	0.0151	U	0.0527				-0.0514	U	0.121	0.0229	U	0.0298	0.00678	U	0.0243	0.0176	U	0.0271
FS-3	J1KRR6	8/25/2011	0.112	U	0.198	-0.0361	U	0.0885				-0.0718	U	0.234	0.0446	U	0.0484	0.000223	U	0.0411	0.00205	U	0.0381
FS-4	J1KRR7	8/25/2011	0.0814	U	0.0810	-0.0118	U	0.101				-0.0290	U	0.215	0.0324	U	0.0497	0.0116	U	0.0419	0.00396	U	0.0425
FS-5	J1KRR5	8/25/2011	0.274	U	0.185	0.00438	U	0.0820				-0.161	U	0.220	0.0289	U	0.0387	-0.00567	U	0.0299	-0.0113	U	0.0292
FS-6	J1KRR4	8/25/2011	-0.130	U	0.310	0.0103	U	0.0787				-0.0547	U	0.177	0.0238	U	0.0386	0.0157	U	0.0341	0.00579	U	0.0351
FS-8	J1KRR1	8/25/2011	-0.114	U	0.171	-0.0101	U	0.0574				-0.0727	U	0.125	0.0206	U	0.0307	0.0111	U	0.0273	0.0106	U	0.0309
FS-9	J1KRP9	8/25/2011	-0.0362	U	0.128	0.0273	U	0.0906				0.00527	U	0.191	0.0412	U	0.0470	0.0184	U	0.0421	0.00643	U	0.0359
FS-10	J1KRR0	8/25/2011	0.0585	U	0.0809	-0.0299	U	0.0955				-0.0156	U	0.219	0.0296	U	0.0483	0.0128	U	0.0429	0.00907	U	0.0422
FS-11	J1KRP8	8/25/2011	-0.122	U	0.151	0.0261	U	0.0784				-0.120	U	0.202	0.0290	U	0.0385	0.0150	U	0.0344	-0.0114	U	0.0305
FS-12	J1KRP7	8/25/2011	-0.00352	U	0.0602	-0.0213	U	0.0803				-0.0560	U	0.163	0.0571	U	0.0442	0.0248	U	0.0391	-0.00496	U	0.0322
FS-13	J1KRP6	8/25/2011	-0.0109	U	0.159	-0.00532	U	0.0534				0.0223	U	0.119	0.0136	U	0.0294	0.0206	U	0.0287	0.00703	U	0.0296
FS-14	J1KRP5	8/25/2011	-0.0315	U	0.128	-0.0294	U	0.0899				-0.0202	U	0.185	0.0441	U	0.0484	0.0254	U	0.0408	-0.0113	U	0.0399
FS-16	J1KRP3	8/25/2011	0.0616	U	0.322	-0.00375	U	0.0780				-0.00893	U	0.182	0.0440	U	0.0419	0.00195	U	0.0339	0.0164	U	0.0396
FS-17	J1KRP2	8/25/2011	-0.0295	U	0.0553	-0.0145	U	0.0783				-0.0688	U	0.160	0.0287	U	0.0433	-0.00656	U	0.0317	0.00959	U	0.0382

Acronyms and notes apply to all of the tables in this attachment.

Gray cells indicate not applicable.

Note: Data qualified with B, C, and/or J are considered acceptable values.

AEA = Alpha Energy Analysis

B = blank contamination (organic constituents) = Estimated (inorganic)

C = Sample concentration ≤5x the blank concentration.

GEA = Gamma Energy Analysis

HEIS=Hanford Environmental Information System

J = estimated

K = Unresolved due to matrix interference. Reported as benzo(b)fluoranthene

N= presumptive evidence of material

PQL = practical quantitation limit

R = analyzed for, detected, and due to an identified major QC deficiency, the data are unusual.

Q = qualifier

U = undetected

UR = analyzed for and not detected in the sample. Data is unusable due to an identified major QC deficiency.

X = >40% difference between the primary and results. The lower of the two results is reported.

Attachment	1	Sheet No.	1 of 12
Originator	N. K. Schiffern n.s.	Date	10/31/11
Checked	I. B. Berezovskiy IBB	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results (Radionuclides)

Sample Location	HEIS Number	Sample Date	Europium-152			Europium-154			Europium-155			Lead-212			Niobium-94			Potassium-40			Radium-226		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
FS-7	J1KRR2	8/25/2011	0.0229	U	0.0806	-0.0569	U	0.108	0.0751	U	0.101										0.480		0.0529
Duplicate of J1KRR2	J1KRR3	8/25/2011	-0.0306	U	0.0868	0.00856	U	0.117	0.0603	U	0.0890										0.469		0.0624
FS-15	J1KRP4	8/25/2011	0.0159	U	0.0857	-0.00816	U	0.107	0.0362	U	0.111										0.408		0.0559
SPLIT of J1KRP4	J1KTT9	8/25/2011	0.0340	U	0.0340	0.0600	U	0.060	0.0430	U	0.0430	0.642		0.0300	0.0140	U	0.0140	14.6		0.166	0.392		0.0290
FS-1	J1KRR9	8/25/2011	0.00468	U	0.0865	0.0146	U	0.109	0.0442	U	0.101										0.465		0.0623
FS-2	J1KRR8	8/25/2011	0.0194	U	0.0599	0.0191	U	0.0814	0.0314	U	0.0718										0.401		0.0407
FS-3	J1KRR6	8/25/2011	-0.0175	U	0.105	0.00618	U	0.134	0.0248	U	0.128										0.430	U	0.142
FS-4	J1KRR7	8/25/2011	-0.0323	U	0.104	-0.0166	U	0.127	-0.00269	U	0.109										0.432		0.0779
FS-5	J1KRR5	8/25/2011	0.0154	U	0.0914	-0.0192	U	0.0946	0.00421	U	0.126										0.387		0.0585
FS-6	J1KRR4	8/25/2011	0.0151	U	0.0824	0.00800	U	0.117	0.0293	U	0.104										0.438	U	0.117
FS-8	J1KRR1	8/25/2011	-0.0193	U	0.0615	-0.0169	U	0.0832	0.0474	U	0.0767										0.413		0.0455
FS-9	J1KRP9	8/25/2011	0.00446	U	0.0926	-0.0143	U	0.125	0.0798	U	0.101										0.405		0.0638
FS-10	J1KRR0	8/25/2011	-0.00477	U	0.109	-0.00928	U	0.130	0.0444	U	0.107										0.416	U	0.140
FS-11	J1KRP8	8/25/2011	0.0668	U	0.0864	-0.00137	U	0.0951	0.0216	U	0.108										0.375		0.0540
FS-12	J1KRP7	8/25/2011	-0.00229	U	0.0871	-0.0160	U	0.116	0.0408	U	0.0806										0.389		0.0604
FS-13	J1KRP6	8/25/2011	-0.00927	U	0.0577	-0.0000306	U	0.0828	0.0223	U	0.0672										0.365	U	0.0974
FS-14	J1KRP5	8/25/2011	0.0119	U	0.0977	0.0260	U	0.136	0.0531	U	0.0984										0.376		0.0653
FS-16	J1KRP3	8/25/2011	0.0260	U	0.0841	0.00221	U	0.121	0.101	U	0.107										0.380		0.0572
FS-17	J1KRP2	8/25/2011	0.0185	U	0.0897	-0.0307	U	0.116	0.0322	U	0.0809										0.391		0.0636

Sample Location	HEIS Number	Sample Date	Radium-228			Ruthenium-106			Thorium-228 GEA			Thorium-232 GEA			Uranium-235 GEA			Uranium-238 GEA			Zinc-65		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
FS-7	J1KRR2	8/25/2011	0.619		0.121	0.0115	U	0.262							0.0836	U	0.173	0.473		0.0589	0.0418	U	0.0802
Duplicate of J1KRR2	J1KRR3	8/25/2011	0.730		0.149	0.0106	U	0.293							0.152	U	0.187	0.492		0.0612	0.0196	U	0.0871
FS-15	J1KRP4	8/25/2011	0.755	U	0.217	-0.0622	U	0.257							0.0609	U	0.209	0.510		0.0604	0.0450	U	0.0801
SPLIT of J1KRP4	J1KTT9	8/25/2011	0.636		0.0770	0.121	U	0.121	0.626		0.0290	0.636		0.0770	0.0880	U	0.0880	2.10	U	2.10	0.0420	U	0.0420
FS-1	J1KRR9	8/25/2011	0.954		0.123	-0.00265	U	0.278							0.666		0.202	0.411		0.0610	0.00932	U	0.0750
FS-2	J1KRR8	8/25/2011	0.756		0.0857	0.0817	U	0.190							0.175		0.124	0.465		0.0414	0.0200	U	0.0565
FS-3	J1KRR6	8/25/2011	0.535		0.139	-0.0585	U	0.315							1.12		0.236	0.417		0.0692	-0.132	U	0.0947
FS-4	J1KRR7	8/25/2011	0.529		0.151	0.0284	U	0.344							0.156	U	0.231	0.407		0.0729	0.0470	U	0.0922
FS-5	J1KRR5	8/25/2011	0.667		0.122	-0.0550	U	0.264							0.383	U	0.241	0.473		0.064	0.0135	U	0.0759
FS-6	J1KRR4	8/25/2011	0.546		0.122	-0.161	U	0.249							0.185	U	0.194	0.377		0.0579	-0.136	U	0.0736
FS-8	J1KRR1	8/25/2011	0.709		0.0992	0.0683	U	0.197							0.114	U	0.134	0.515		0.0463	0.00589	U	0.0651
FS-9	J1KRP9	8/25/2011	0.653		0.138	0.0419	U	0.325							0.0333	U	0.199	0.482		0.0667	-0.164	U	0.0814
FS-10	J1KRR0	8/25/2011	0.590		0.148	0.00454	U	0.342							0.176	U	0.231	0.441		0.0765	-0.134	U	0.0936
FS-11	J1KRP8	8/25/2011	0.554		0.120	-0.0737	U	0.259							0.0309	U	0.203	0.437		0.0589	-0.102	U	0.0715
FS-12	J1KRP7	8/25/2011	0.709		0.124	0.0254	U	0.278							0.0868	U	0.179	0.413		0.0622	-0.00934	U	0.0773
FS-13	J1KRP6	8/25/2011	0.668		0.0891	0.0223	U	0.211							0.0330	U	0.128	0.459		0.0447	-0.0999	U	0.0606
FS-14	J1KRP5	8/25/2011	0.679		0.128	-0.0415	U	0.288							0.0633	U	0.197	0.446		0.0688	-0.0288	U	0.0814
FS-16	J1KRP3	8/25/2011	0.519		0.132	-0.0540	U	0.264							0.125	U	0.191	0.472		0.0601	0.00694	U	0.0850
FS-17	J1KRP2	8/25/2011	0.705		0.115	-0.0242	U	0.284							0.00984	U	0.170	0.452		0.0593	-0.0278	U	0.0836

Attachment	1	Sheet No.	2 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	I. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results (Radionuclides)

Sample Location	HEIS Number	Sample Date	Gross alpha			Gross beta		
			pCi/g	Q	MDA	pCi/g	Q	MDA
FS-7	J1KRR2	8/25/2011	7.83		4.70	25.4		4.77
Duplicate of J1KRR2	J1KRR3	8/25/2011	8.37		3.92	23.9		4.54
FS-15	J1KRP4	8/25/2011	8.60		4.69	29.3		4.48
SPLIT of J1KRP4	J1KTT9	8/25/2011	6.72		3.89	19.0		4.92
FS-1	J1KRR9	8/25/2011	34.8		6.07	66.6		4.79
FS-2	J1KRR8	8/25/2011	7.18		4.79	32.1		4.47
FS-3	J1KRR6	8/25/2011	64.2		6.52	89.8		4.78
FS-4	J1KRR7	8/25/2011	8.76		3.92	28.0		4.85
FS-5	J1KRR5	8/25/2011	25.6		6.06	38.8		4.50
FS-6	J1KRR4	8/25/2011	12.8		4.79	37.8		4.53
FS-8	J1KRR1	8/25/2011	17.0		5.56	31.3		4.92
FS-9	J1KRP9	8/25/2011	6.63		4.20	27.3		4.79
FS-10	J1KRR0	8/25/2011	14.3		5.22	30.5		4.79
FS-11	J1KRP8	8/25/2011	8.60		4.70	24.6		4.47
FS-12	J1KRP7	8/25/2011	10.9		5.57	29.4		4.84
FS-13	J1KRP6	8/25/2011	4.39	U	5.23	31.7		4.78
FS-14	J1KRP5	8/25/2011	8.96		4.19	24.0		4.50
FS-16	J1KRP3	8/25/2011	13.6		5.23	30.3		4.77
FS-17	J1KRP2	8/25/2011	7.79		4.19	21.6		4.93

Sample Location	HEIS Number	Sample Date	Uranium-233/234 (AEA)			Uranium-234 (AEA)			Uranium-235 (AEA)			Uranium-238 (AEA)		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
FS-7	J1KRR2	8/25/2011				0.546		0.171	0.00	U	0.171	0.137	U	0.171
Duplicate of J1KRR2	J1KRR3	8/25/2011				0.739		0.126	0.0303	U	0.141	0.200		0.126
FS-15	J1KRP4	8/25/2011				0.832		0.120	0.00	U	0.120	0.832		0.120
SPLIT of J1KRP4	J1KTT9	8/25/2011	0.641		0.223				0.00	UJ	0.270	0.787		0.223
FS-1	J1KRR9	8/25/2011				38.8		0.112	1.85		0.112	37.2		0.112
FS-2	J1KRR8	8/25/2011				6.56		0.127	0.204		0.113	3.91		0.160
FS-3	J1KRR6	8/25/2011				30.5		0.235	1.79		0.241	27.4		0.187
FS-4	J1KRR7	8/25/2011				2.92		0.140	0.172		0.134	2.74		0.167
FS-5	J1KRR5	8/25/2011				9.99		0.142	0.221		0.118	11.2		0.118
FS-6	J1KRR4	8/25/2011				7.08		0.115	0.248		0.103	7.39		0.132
FS-8	J1KRR1	8/25/2011				8.79		0.120	0.383		0.120	7.22		0.120
FS-9	J1KRP9	8/25/2011				5.87		0.146	0.162		0.133	5.90		0.142
FS-10	J1KRR0	8/25/2011				5.35		0.163	0.206		0.125	3.92		0.179
FS-11	J1KRP8	8/25/2011				3.50		0.153	0.0709	U	0.170	2.55		0.128
FS-12	J1KRP7	8/25/2011				3.05		0.203	0.135	U	0.169	2.96		0.169
FS-13	J1KRP6	8/25/2011				4.50		0.196	0.105	U	0.196	4.96		0.251
FS-14	J1KRP5	8/25/2011				0.914		0.0927	-0.00124	U	0.0927	0.716		0.0927
FS-16	J1KRP3	8/25/2011				5.32		0.119	0.319		0.119	4.05		0.119
FS-17	J1KRP2	8/25/2011				0.328		0.148	-0.00983	U	0.153	0.0758	U	0.148

Attachment	1	Sheet No.	3 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	I. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results (Metals)

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron			Cadmium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	7480	X	1.5	0.37	U	0.37	3.8		0.64	77.5	X	0.073	0.39		0.032	0.94	U	0.94	0.065	B	0.039
Duplicate of J1KRR2	J1KRR3	8/25/2011	7760	X	1.7	0.43	U	0.43	2.2		0.74	79.9	X	0.085	0.39		0.037	1.1	B	1.1	0.064	B	0.046
FS-15	J1KRP4	8/25/2011	6860	X	1.4	0.35	U	0.35	1.9		0.61	78.5	X	0.071	0.37		0.031	1.0	B	0.91	0.098	B	0.038
SPLIT of J1KRP4	J1KTT9	8/25/2011	5480		3.80	0.456	UJ	0.456	2.38		0.761	71.5		0.380	0.249		0.152	1.02	B	1.52	0.0752	B	0.152
FS-1	J1KRR9	8/25/2011	7800	X	1.5	0.37	U	0.37	2.8		0.64	87.3	X	0.073	0.56	B	0.16	0.95	U	0.95	0.086	B	0.040
FS-2	J1KRR8	8/25/2011	8370	X	1.3	0.33	U	0.33	2.2		0.56	89.1	X	0.065	0.56	B	0.14	0.84	U	0.84	0.13	B	0.035
FS-3	J1KRR6	8/25/2011	6300	X	1.4	0.33	U	0.33	2.4		0.58	70.9	X	0.066	0.36		0.029	0.86	U	0.86	0.087	B	0.036
FS-4	J1KRR7	8/25/2011	9420	X	1.5	0.37	U	0.37	2.7		0.65	91.1	X	0.075	0.40		0.033	0.97	U	0.97	0.22		0.040
FS-5	J1KRR5	8/25/2011	7110	X	1.4	0.33	U	0.33	2.0		0.58	79.9	X	0.066	0.37		0.029	1.4	B	0.85	0.11	B	0.036
FS-6	J1KRR4	8/25/2011	7170	X	1.6	0.38	U	0.38	2.4		0.66	82.7	X	0.076	0.38		0.033	1.4	B	0.98	0.14	B	0.041
FS-8	J1KRR1	8/25/2011	7150	X	1.5	0.38	U	0.38	2.3		0.66	75.1	X	0.076	0.35		0.033	2.3		0.98	0.15	B	0.041
FS-9	J1KRP9	8/25/2011	6220	X	1.5	0.36	U	0.36	2.0		0.63	77.1	X	0.073	0.34		0.032	2.0		0.94	0.16	B	0.039
FS-10	J1KRR0	8/25/2011	6880	X	1.6	0.38	U	0.38	2.4		0.66	78.3	X	0.076	0.36		0.033	1.5	B	0.98	0.14	B	0.041
FS-11	J1KRP8	8/25/2011	6340	X	1.4	0.35	U	0.35	3.1		0.60	77.8	X	0.069	0.36		0.030	1.3	B	0.89	0.11	B	0.037
FS-12	J1KRP7	8/25/2011	7050	X	1.5	0.36	U	0.36	2.3		0.63	84.9	X	0.073	0.38		0.032	1.8	B	0.94	0.20		0.039
FS-13	J1KRP6	8/25/2011	6710	X	1.4	0.35	U	0.35	2.3		0.61	78.6	X	0.071	0.47	B	0.15	1.8	B	0.91	0.14	B	0.038
FS-14	J1KRP5	8/25/2011	6170	X	1.4	0.35	U	0.35	2.1		0.61	72.6	X	0.071	0.33		0.031	1.4	B	0.91	0.13	B	0.038
FS-16	J1KRP3	8/25/2011	6810	X	1.5	0.37	U	0.37	2.2		0.65	81.6	X	0.075	0.37		0.032	1.4	B	0.96	0.36		0.040
FS-17	J1KRP2	8/25/2011	6970	X	1.5	0.37	U	0.37	2.1		0.64	79.2	X	0.074	0.36		0.032	0.95	U	0.95	0.074	B	0.040
Equipment Blank	J1KRP1	8/25/2011	166	X	1.5	0.36	U	0.36	0.63	U	0.63	1.6	X	0.073	0.032	U	0.032	0.94	U	0.94	0.039	U	0.039

Sample Location	HEIS Number	Sample Date	Calcium			Chromium			Cobalt			Copper			Iron			Lead			Lithium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	3360	X	13.6	9.1	X	0.056	8.0		0.096	13.9		0.21	21400	X	3.7	5.6		0.26	7.3		0.29
Duplicate of J1KRR2	J1KRR3	8/25/2011	3460	X	15.8	10	X	0.065	7.4		0.11	12.9		0.24	22000	X	4.3	4.1		0.30	7.9		0.34
FS-15	J1KRP4	8/25/2011	3470	X	13.1	8.9	X	0.054	6.7		0.093	12.0		0.20	21200	X	3.5	4.1		0.25	7.2		0.28
SPLIT of J1KRP4	J1KTT9	8/25/2011	2780		76.1	9.37		0.152	5.69		1.52	9.62		0.761	16900		15.2	3.09		0.380	6.86		1.90
FS-1	J1KRR9	8/25/2011	8320	X	13.6	9.1	X	0.056	10.3		0.48	19.9		1.0	24400	X	3.7	5.2		1.3	7.6		0.29
FS-2	J1KRR8	8/25/2011	6240	X	12.1	9.8	X	0.050	10.6		0.43	39.2		0.93	23000	X	3.3	26.4		1.2	7.6		0.26
FS-3	J1KRR6	8/25/2011	5830	X	12.3	12.7	X	0.051	6.3		0.087	32.8		0.19	19100	X	3.3	16.8		0.24	6.3		0.26
FS-4	J1KRR7	8/25/2011	4020	X	13.9	25.6	X	0.057	8.5		0.099	25.0		0.21	22300	X	3.7	9.5		0.27	8.9		0.30
FS-5	J1KRR5	8/25/2011	4240	X	12.3	10.1	X	0.051	6.7		0.087	16.9		0.19	19900	X	3.3	7.2		0.24	7.4		0.26
FS-6	J1KRR4	8/25/2011	4880	X	14.1	11.6	X	0.058	7.2		0.10	25.6		0.22	20900	X	3.8	6.6		0.27	7.2		0.30
FS-8	J1KRR1	8/25/2011	6790	X	14.0	11.5	X	0.058	6.7		0.10	17.7		0.22	20400	X	3.8	5.6		0.27	7.3		0.30
FS-9	J1KRP9	8/25/2011	9220	X	13.5	13.2	X	0.055	6.7		0.096	20.6		0.21	20300	X	3.6	5.9		0.26	6.5		0.29
FS-10	J1KRR0	8/25/2011	5710	X	14.2	9.6	X	0.058	7.4		0.10	17.4		0.22	19900	X	3.8	6.9		0.27	6.7		0.30
FS-11	J1KRP8	8/25/2011	5010	X	12.8	9.0	X	0.053	6.9		0.091	16.4		0.20	20600	X	3.5	6.0		0.25	6.6		0.27
FS-12	J1KRP7	8/25/2011	5500	X	13.5	9.9	X	0.055	7.3		0.096	18.9	X	0.21	21100		3.6	11.4		0.26	7.3		0.29
FS-13	J1KRP6	8/25/2011	5750	X	13.1	8.9	X	0.054	8.8		0.46	20.3		1.0	22700	X	3.5	7.9		1.3	7.3		0.28
FS-14	J1KRP5	8/25/2011	5090	X	13.1	11.8	X	0.054	6.3		0.093	14.7		0.20	18700	X	3.5	10		0.25	6.5		0.28
FS-16	J1KRP3	8/25/2011	3630	X	13.8	8.5	X	0.057	7.0		0.098	223		0.21	19800	X	3.7	4.6		0.26	6.8		0.29
FS-17	J1KRP2	8/25/2011	3380	X	13.7	10.5	X	0.056	6.7		0.097	12.0		0.21	19900	X	3.7	3.9		0.26	7.2		0.29
Equipment Blank	J1KRP1	8/25/2011	33.6	BX	13.5	0.16	BX	0.056	0.10	B	0.096	0.21	U	0.21	226	X	3.6	0.55		0.26	0.29	U	0.29

Attachment	1	Sheet No.	4 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	J. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results (Metals)

Sample Location	HEIS Number	Sample Date	Magnesium			Manganese			Mercury			Molybdenum			Nickel			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	4280	X	3.6	353	X	0.096	0.0051	U	0.0051	0.25	U	0.25	9.5	X	0.12	1600		39.5	0.83	U	0.83
Duplicate of J1KRR2	J1KRR3	8/25/2011	4590	X	4.2	354	X	0.11	0.0066	U	0.0066	0.29	U	0.29	10.7	X	0.14	1660		46.0	0.97	U	0.97
FS-15	J1KRP4	8/25/2011	4080	X	3.4	325	X	0.093	0.0050	U	0.0050	0.24	U	0.24	9.1	X	0.11	1420		38.1	0.80	U	0.80
SPLIT of J1KRP4	J1KTT9	8/25/2011	3860		57.1	247		3.80	0.0238	U	0.0238	0.254	B	1.52	8.64		3.04	1160		304	0.228	U	0.228
FS-1	J1KRR9	8/25/2011	4990	X	3.6	344	X	0.097	0.020		0.0050	0.25	U	0.25	10.9	X	0.12	1040		39.6	0.83	U	0.83
FS-2	J1KRR8	8/25/2011	4610	X	3.2	354	X	0.086	0.021		0.0055	0.22	U	0.22	11.6	X	0.11	1300		35.1	0.74	U	0.74
FS-3	J1KRR6	8/25/2011	3860	X	3.2	294	X	0.087	0.049		0.0048	0.23	U	0.23	9.4	X	0.11	1210		35.8	0.75	U	0.75
FS-4	J1KRR7	8/25/2011	4990	X	3.6	346	X	0.099	0.012	B	0.0051	0.26	U	0.26	13.5	X	0.12	1280		40.4	0.85	U	0.85
FS-5	J1KRR5	8/25/2011	3990	X	3.2	319	X	0.087	0.017		0.0050	0.23	U	0.23	9.9	X	0.11	1440		35.7	0.75	U	0.75
FS-6	J1KRR4	8/25/2011	4370	X	3.7	321	X	0.10	0.0073	B	0.0054	0.26	U	0.26	11.0	X	0.12	1410		41.1	0.86	U	0.86
FS-8	J1KRR1	8/25/2011	5190	X	3.7	324	X	0.10	0.012	B	0.0049	0.26	U	0.26	11.8	X	0.12	1390		40.8	0.86	U	0.86
FS-9	J1KRP9	8/25/2011	6750	X	3.5	292	X	0.096	0.016	B	0.0055	0.25	U	0.25	11.4	X	0.12	1110		39.2	0.82	U	0.82
FS-10	J1KRR0	8/25/2011	4770	X	3.7	316	X	0.10	0.0058	B	0.0055	0.26	U	0.26	11.7	X	0.12	1250		41.2	0.86	U	0.86
FS-11	J1KRP8	8/25/2011	4050	X	3.4	310	X	0.091	0.0059	B	0.0049	0.36	B	0.24	9.6	X	0.11	1110		37.3	0.78	U	0.78
FS-12	J1KRP7	8/25/2011	4280	X	3.5	310	X	0.096	0.025		0.0051	0.25	U	0.25	11.5	X	0.12	1220		39.2	0.82	U	0.82
FS-13	J1KRP6	8/25/2011	4300	X	3.4	322	X	0.093	0.020		0.0049	0.24	U	0.24	10.6	X	0.11	1240		38.1	0.80	U	0.80
FS-14	J1KRP5	8/25/2011	3820	X	3.4	277	X	0.093	0.0051	U	0.0051	0.42	B	0.24	10.1	X	0.11	1090		38.0	0.80	U	0.80
FS-16	J1KRP3	8/25/2011	3880	X	3.6	321	X	0.098	0.026		0.0051	0.26	U	0.26	9.5	X	0.12	1390		40.2	0.84	U	0.84
FS-17	J1KRP2	8/25/2011	4180	X	3.6	317	X	0.097	0.0050	U	0.0050	0.25	U	0.25	11.0	X	0.12	1540		39.8	0.83	U	0.83
Equipment Blank	J1KRP1	8/25/2011	19.9	X	3.6	4.1	X	0.096	0.0049	U	0.0049	0.57	B	0.25	0.12	BX	0.12	43.9	B	39.3	0.83	U	0.83

Sample Location	HEIS Number	Sample Date	Silicon			Silver			Sodium			Uranium			Vanadium			Zinc			Zirconium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	267		5.4	0.15	U	0.15	500		56.8	0.95		0.0015	42.0		0.091	41.4	X	0.38	18.8	X	0.34
Duplicate of J1KRR2	J1KRR3	8/25/2011	299		6.4	0.18	U	0.18	504		66.3	0.85		0.0018	44.5		0.11	42.5	X	0.45	19.7	X	0.40
FS-15	J1KRP4	8/25/2011	243		5.3	0.15	U	0.15	264		54.8	1.4		0.0013	44.9		0.087	41.9	X	0.37	19.2	X	0.33
SPLIT of J1KRP4	J1KTT9	8/25/2011	367		1.52	0.152	U	0.152	218		38.0	15.2	U	15.2	44.0		1.90	37.5		7.61	15.7		1.90
FS-1	J1KRR9	8/25/2011	233		5.5	0.15	U	0.15	329		57.0	37.0		0.0016	65.7		0.45	48.2	X	0.38	30.0	X	0.34
FS-2	J1KRR8	8/25/2011	347		4.8	0.14	U	0.14	1570		50.5	7.5		0.0014	58.7		0.40	55.7	X	0.34	27.8	X	0.30
FS-3	J1KRR6	8/25/2011	269		4.9	0.14	U	0.14	1730		51.5	34.0		0.0016	41.0		0.082	42.6	X	0.35	21.5	X	0.31
FS-4	J1KRR7	8/25/2011	302		5.6	0.16	U	0.16	1070		58.1	7.7		0.0014	45.6		0.093	66.2	X	0.39	25.0	X	0.35
FS-5	J1KRR5	8/25/2011	217		4.9	0.14	U	0.14	282		51.4	21.8		0.0015	40.8		0.082	44.5	X	0.35	19.4	X	0.31
FS-6	J1KRR4	8/25/2011	254		5.7	0.16	U	0.16	214		59.1	16.5		0.0013	44.3		0.094	54.4	X	0.40	21.2	X	0.35
FS-8	J1KRR1	8/25/2011	270		5.6	0.16	U	0.16	301		58.7	10.6		0.0015	43.2		0.094	58.7	X	0.40	19.9	X	0.35
FS-9	J1KRP9	8/25/2011	202		5.4	0.15	U	0.15	263		56.4	5.8		0.0015	46.4		0.090	73.3	X	0.38	20.9	X	0.34
FS-10	J1KRR0	8/25/2011	237		5.7	0.16	U	0.16	313		59.2	11.2		0.0016	42.7		0.094	93.9	X	0.40	20.0	X	0.36
FS-11	J1KRP8	8/25/2011	210		5.1	0.15	U	0.15	237		53.6	5.0		0.0014	44.8		0.085	50.7	X	0.36	18.3	X	0.32
FS-12	J1KRP7	8/25/2011	236		5.4	0.15	U	0.15	255		56.4	6.5		0.0015	46.5		0.090	97.8	X	0.38	21.4	X	0.34
FS-13	J1KRP6	8/25/2011	230		5.3	0.15	U	0.15	212		54.9	3.4		0.0014	59.5		0.44	59.1	X	0.37	23.0	X	0.33
FS-14	J1KRP5	8/25/2011	265		5.3	0.15	U	0.15	248		54.7	1.7		0.0014	43.7		0.087	53.3	X	0.37	17.2	X	0.33
FS-16	J1KRP3	8/25/2011	256		5.6	0.16	U	0.16	181		57.9	7.3		0.0014	40.8		0.092	175	X	0.39	18.4	X	0.35
FS-17	J1KRP2	8/25/2011	240		5.5	0.16	U	0.16	162		57.3	0.52		0.0016	41.1		0.091	39.4	X	0.39	18.1	X	0.34
Equipment Blank	J1KRP1	8/25/2011	128		5.4	0.15	U	0.15	56.6	U	56.6	0.20		0.0014	0.20	B	0.090	1.2	X	0.38	0.45	BX	0.34

Attachment	1	Sheet No.	5 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	I. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results (TPH & General Chemistry)

Sample Location	HEIS Number	Sample Date	TPH - diesel range			TPH - diesel range EXT			TPH - motor oil			pH Measurement			Percent moisture (wet sample)			Percent Solids		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	pH unit	Q	PQL	%	Q	PQL	%	Q	PQL
FS-7	J1KRR2	8/25/2011	840	J	650	1000	J	960				9.59		0.0100	0.14		0.10			
Duplicate of J1KRR2	J1KRR3	8/25/2011	940	J	780	1400	J	1100				9.49		0.0100	16.0		0.10			
FS-15	J1KRP4	8/25/2011	670	U	670	1900	J	990				8.85		0.0100	0.36		0.10			
SPLIT of J1KRP4	J1KTT9	8/25/2011	3320	U	3320				9960	UJ	9960	8.81	J	0.10				99.6		0.1
FS-1	J1KRR9	8/25/2011	1500	J	670	3100	J	980				9.35		0.0100	0.39		0.10			
FS-2	J1KRR8	8/25/2011	1400	J	680	2600	J	1000				10.0		0.0100	0.92		0.10			
FS-3	J1KRR6	8/25/2011	1000	J	670	4700		990				10.2		0.0100	0.39		0.10			
FS-4	J1KRR7	8/25/2011	1400	J	670	3500	J	980				8.10		0.0100	0.51		0.10			
FS-5	J1KRR5	8/25/2011	2000	J	660	9300		970				9.15		0.0100	0.27		0.10			
FS-6	J1KRR4	8/25/2011	2600	J	670	12000		990				9.09		0.0100	0.13		0.10			
FS-8	J1KRR1	8/25/2011	810	J	670	2100	J	980				9.41		0.0100	0.51		0.10			
FS-9	J1KRP9	8/25/2011	2400	J	680	9100		1000				9.01		0.0100	0.41		0.10			
FS-10	J1KRR0	8/25/2011	35000		710	86000		1000				9.31		0.0100	4.2		0.10			
FS-11	J1KRP8	8/25/2011	5300		680	20000		990				8.85		0.0100	0.89		0.10			
FS-12	J1KRP7	8/25/2011	18000	N	670	54000	N	980				8.76		0.0100	0.42		0.10			
FS-13	J1KRP6	8/25/2011	12000		670	40000		980				8.74		0.0100	0.41		0.10			
FS-14	J1KRP5	8/25/2011	44000		670	140000		990				8.51		0.0100	0.20		0.10			
FS-16	J1KRP3	8/25/2011	3100	J	670	18000		980				7.65		0.0100	0.10	U	0.10			
FS-17	J1KRP2	8/25/2011	670	U	670	980	U	980				7.87		0.0100	0.10	U	0.10			
Equipment Blank	J1KRP1	8/25/2011													0.74		0.10			
TRIP Blank 1	J1KTX5	8/25/2011																99.3		0.1

Attachment	1	Sheet No.	6 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	I. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results (Anions)

Sample Location	HEIS Number	Sample Date	Bromide			Chloride			Fluoride			Nitrate			Nitrite			Nitrogen in Nitrate			Nitrogen in Nitrite		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	0.38	U	0.38	2.0	U	2.0	0.81	U	0.81							0.55	BJ	0.31	0.33	UR	0.33
Duplicate of J1KRR2	J1KRR3	8/25/2011	0.46	U	0.46	2.3	U	2.3	0.97	U	0.97							0.54	BJ	0.37	0.40	UR	0.40
FS-15	J1KRP4	8/25/2011	0.39	U	0.39	2.0	U	2.0	0.90	B	0.82							0.77	BJ	0.32	0.34	UR	0.34
SPLIT of J1KRP4	J1KTT9	8/25/2011	5.0	U	5.0	1.5	B	5.0	5.0	U	5.0	2.1	BJ	5.0	5.0	UR	5.0						
FS-1	J1KRR9	8/25/2011	0.39	U	0.39	2.0	U	2.0	4.7	B	0.83							0.62	BJ	0.32	0.34	UR	0.34
FS-2	J1KRR8	8/25/2011	0.39	U	0.39	5.0		2.0	1.6	B	0.83							1.8	BJ	0.32	0.34	UR	0.34
FS-3	J1KRR6	8/25/2011	0.39	U	0.39	7.5		2.0	2.4	B	0.83							8.3	J	0.32	0.34	UR	0.34
FS-4	J1KRR7	8/25/2011	0.39	U	0.39	4.7	B	2.0	94.0		0.83							1.2	BJ	0.32	0.34	UR	0.34
FS-5	J1KRR5	8/25/2011	0.39	U	0.39	2.0	U	2.0	0.82	U	0.82							2.6	J	0.31	0.33	UR	0.33
FS-6	J1KRR4	8/25/2011	0.38	U	0.38	3.2	B	2.0	1.3	B	0.81							1.7	BJ	0.31	0.33	UR	0.33
FS-8	J1KRR1	8/25/2011	0.39	U	0.39	2.0	U	2.0	0.82	U	0.82							2.5	J	0.31	0.33	UR	0.33
FS-9	J1KRP9	8/25/2011	0.39	U	0.39	10.3		2.0	0.83	U	0.83							6.1	J	0.32	0.34	UR	0.34
FS-10	J1KRR0	8/25/2011	0.40	U	0.40	19.5		2.0	0.85	U	0.85							3.1	J	0.32	0.35	UR	0.35
FS-11	J1KRP8	8/25/2011	0.64	B	0.39	35.6		2.0	0.83	U	0.83							6.7	J	0.32	0.34	UR	0.34
FS-12	J1KRP7	8/25/2011	0.39	U	0.39	7.5		2.0	1.4	B	0.83							3.0	J	0.32	0.34	UR	0.34
FS-13	J1KRP6	8/25/2011	0.39	U	0.39	30.2		2.0	0.91	B	0.83							8.6	J	0.32	0.34	UR	0.34
FS-14	J1KRP5	8/25/2011	0.70	B	0.39	48.0		2.0	1.5	B	0.82							3.1	J	0.31	0.34	UR	0.34
FS-16	J1KRP3	8/25/2011	0.39	U	0.39	2.0	U	2.0	2.5	B	0.82							0.95	BJ	0.31	0.34	UR	0.34
FS-17	J1KRP2	8/25/2011	0.39	U	0.39	2.0	U	2.0	0.82	UN	0.82							0.62	BJ	0.31	0.34	UR	0.34

Sample Location	HEIS Number	Sample Date	Nitrogen in Nitrite and Nitrate			Phosphate			Phosphorus in phosphate			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-7	J1KRR2	8/25/2011	0.61	B	0.30				1.2	UR	1.2	4.7	B	1.7
Duplicate of J1KRR2	J1KRR3	8/25/2011	0.40	B	0.36				1.5	UR	1.5	6.8		2.0
FS-15	J1KRP4	8/25/2011	0.67	B	0.30				1.2	UR	1.2	3.5	B	1.7
SPLIT of J1KRP4	J1KTT9	8/25/2011	0.51		0.50	3.3	BJ	10.0				3.5	BU	5.0
FS-1	J1KRR9	8/25/2011	0.66	B	0.30				1.2	UR	1.2	4.5	B	1.7
FS-2	J1KRR8	8/25/2011	2.0		0.30				1.3	UR	1.3	29		1.7
FS-3	J1KRR6	8/25/2011	8.4		0.30				1.2	UR	1.2	37.4		1.7
FS-4	J1KRR7	8/25/2011	1.1		0.30				6.9	J	1.2	9.5		1.7
FS-5	J1KRR5	8/25/2011	2.6		0.30				1.2	UR	1.2	27.4		1.7
FS-6	J1KRR4	8/25/2011	1.7		0.30				1.2	UR	1.2	9.4		1.7
FS-8	J1KRR1	8/25/2011	2.7		0.30				1.2	UR	1.2	30.5		1.7
FS-9	J1KRP9	8/25/2011	4.9		0.30				1.2	UR	1.2	163		1.7
FS-10	J1KRR0	8/25/2011	1.3		0.31				1.3	UR	1.3	47.8		1.8
FS-11	J1KRP8	8/25/2011	6.4		0.30				1.3	UR	1.3	65.5		1.7
FS-12	J1KRP7	8/25/2011	2.7		0.30				1.2	UR	1.2	11.2		1.7
FS-13	J1KRP6	8/25/2011	6.4		0.30				1.2	UR	1.2	9.7		1.7
FS-14	J1KRP5	8/25/2011	3.0		0.30				1.2	UR	1.2	31.2		1.7
FS-16	J1KRP3	8/25/2011	0.89		0.30				1.2	UR	1.2	19.1		1.7
FS-17	J1KRP2	8/25/2011	0.64	B	0.30				1.2	UR	1.2	2.9	B	1.7

Attachment	1	Sheet No.	7 of 12
Originator	N.K. Schiffern	Date	11/3/11
Checked	I. B. Berezovskiy	Date	11/3/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results

CONSTITUENT	CLASS	FS-7 - J1KRR2			Duplicate of J1KRR2 - J1KRR3			FS-15 - J1KRP4			Split of J1KRP4 - J1KTT9			FS-1 - J1KRR9		
		8/25/2011			8/25/2011			8/25/2011			8/25/2011			8/25/2011		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	0.73	U	0.73	0.85	U	0.85	0.78	U	0.78	7.85	U	7.85	0.70	U	0.70
1,1,2,2-Tetrachloroethane	VOA	0.86	U	0.86	1.0	U	1.0	0.91	U	0.91	7.85	U	7.85	0.82	U	0.82
1,1,2-Trichloroethane	VOA	1.2	U	1.2	1.4	U	1.4	1.3	U	1.3	7.85	U	7.85	1.2	U	1.2
1,1-Dichloroethane	VOA	0.30	U	0.30	0.34	U	0.34	0.31	U	0.31	7.85	U	7.85	0.28	U	0.28
1,1-Dichloroethene	VOA	1.5	J	0.83	0.97	U	0.97	0.88	U	0.88	7.85	U	7.85	0.79	U	0.79
1,2-Dichloroethane	VOA	0.99	U	0.99	1.1	U	1.1	1.0	U	1.0	9.41	U	9.41	0.94	U	0.94
1,2-Dichloroethene(Total)	VOA	0.55	U	0.55	0.64	U	0.64	0.58	U	0.58	7.85	U	7.85	0.52	U	0.52
1,2-Dichloropropane	VOA	0.78	U	0.78	0.90	U	0.90	0.82	U	0.82	7.85	U	7.85	0.74	U	0.74
2-Butanone	VOA	2.6	U	2.6	3.0	J	3.0	2.7	U	2.7	18.8	U	18.8	3.3	J	2.4
2-Hexanone	VOA	6.9	U	6.9	8.0	U	8.0	7.3	U	7.3	18.8	U	18.8	6.5	U	6.5
4-Methyl-2-Pentanone	VOA	6.2	U	6.2	7.1	U	7.1	6.5	U	6.5	18.8	U	18.8	5.8	U	5.8
Acetone	VOA	29		7.6	15	J	8.8	8.9	J	8.0	18.8	U	18.8	24	J	7.2
Benzene	VOA	0.66	U	0.66	0.77	U	0.77	0.70	U	0.70	7.85	U	7.85	0.63	U	0.63
Bromodichloromethane	VOA	0.31	U	0.31	0.36	U	0.36	0.33	U	0.33	9.41	U	9.41	0.29	U	0.29
Bromoform	VOA	0.32	U	0.32	0.38	U	0.38	0.34	U	0.34	7.85	U	7.85	0.31	U	0.31
Bromomethane	VOA	0.71	U	0.71	0.82	U	0.82	0.75	U	0.75	15.7	U	15.7	0.67	U	0.67
Carbon disulfide	VOA	0.59	U	0.59	0.69	U	0.69	0.63	U	0.63	7.85	U	7.85	0.56	U	0.56
Carbon tetrachloride	VOA	0.89	U	0.89	1.0	U	1.0	0.94	U	0.94	7.85	U	7.85	0.84	U	0.84
Chlorobenzene	VOA	0.76	U	0.76	0.88	U	0.88	0.81	U	0.81	7.85	U	7.85	0.72	U	0.72
Chloroethane	VOA	1.3	U	1.3	1.5	U	1.5	1.3	U	1.3	15.7	U	15.7	1.2	U	1.2
Chloroform	VOA	0.41	U	0.41	0.47	U	0.47	0.43	U	0.43	7.85	U	7.85	0.39	U	0.39
Chloromethane	VOA	1.1	U	1.1	1.3	U	1.3	1.1	U	1.1	15.7	U	15.7	1.0	U	1.0
cis-1,2-Dichloroethylene	VOA										7.85	U	7.85			
cis-1,3-Dichloropropene	VOA	1.8	U	1.8	2.1	U	2.1	1.9	U	1.9	7.85	U	7.85	1.7	U	1.7
Dibromochloromethane	VOA	0.80	U	0.80	0.93	U	0.93	0.85	U	0.85	7.85	U	7.85	0.76	U	0.76
Ethylbenzene	VOA	0.95	U	0.95	1.1	U	1.1	1.0	U	1.0	7.85	U	7.85	0.90	U	0.90
Methylenechloride	VOA	1.1	J	1.1	1.2	U	1.2	1.1	U	1.1	10	U	9.41	1.0	U	1.0
Styrene	VOA	0.89	U	0.89	1.0	U	1.0	0.94	U	0.94	7.85	U	7.85	0.84	U	0.84
Tetrachloroethene	VOA	0.83	U	0.83	0.97	U	0.97	0.88	U	0.88	7.85	U	7.85	0.79	U	0.79
Toluene	VOA	0.97	U	0.97	1.1	U	1.1	1.0	U	1.0	7.85	U	7.85	0.92	U	0.92
trans-1,2-Dichloroethylene	VOA										7.85	U	7.85			
trans-1,3-Dichloropropene	VOA	0.95	U	0.95	1.1	U	1.1	1.0	U	1.0	7.85	U	7.85	0.90	U	0.90
Trichloroethene	VOA	0.32	U	0.32	0.38	U	0.38	0.34	U	0.34	7.85	U	7.85	0.31	U	0.31
Vinyl chloride	VOA	1.9	U	1.9	2.2	U	2.2	2.0	U	2.0	15.7	U	15.7	1.8	U	1.8
Xylenes (total)	VOA	0.86	U	0.86	1.0	U	1.0	0.91	U	0.91	7.85	U	7.85	0.82	U	0.82

Attachment	1	Sheet	8 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	I. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results

CONSTITUENT	CLASS	FS-2 - J1KRR8			FS-3 - J1KRR6			FS-4 - J1KRR7			FS-5 - J1KRR5			FS-6 - J1KRR4		
		8/25/2011			8/25/2011			8/25/2011			8/25/2011			8/25/2011		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	0.71	U	0.71	0.72	U	0.72	0.80	U	0.80	0.70	U	0.70	0.85	U	0.85
1,1,2,2-Tetrachloroethane	VOA	0.84	U	0.84	0.84	U	0.84	0.94	U	0.94	0.83	U	0.83	1.0	U	1.0
1,1,2-Trichloroethane	VOA	1.2	U	1.2	1.2	U	1.2	1.4	U	1.4	1.2	U	1.2	1.4	U	1.4
1,1-Dichloroethane	VOA	0.29	U	0.29	0.29	U	0.29	0.33	U	0.33	0.28	U	0.28	0.34	U	0.34
1,1-Dichloroethene	VOA	1.1	J	0.81	0.81	U	0.81	0.91	U	0.91	1.0	J	0.80	1.2	J	0.96
1,2-Dichloroethane	VOA	0.96	U	0.96	0.96	U	0.96	1.1	U	1.1	0.95	U	0.95	1.1	U	1.1
1,2-Dichloroethene(Total)	VOA	0.53	U	0.53	0.54	U	0.54	0.60	U	0.60	0.53	U	0.53	0.64	U	0.64
1,2-Dichloropropane	VOA	0.75	U	0.75	0.76	U	0.76	0.85	U	0.85	0.75	U	0.75	0.90	U	0.90
2-Butanone	VOA	2.5	U	2.5	2.5	U	2.5	2.9	J	2.8	3.3	J	2.5	4.8	J	3.0
2-Hexanone	VOA	6.7	U	6.7	6.7	U	6.7	7.6	U	7.6	6.6	U	6.6	8.0	U	8.0
4-Methyl-2-Pentanone	VOA	6.0	U	6.0	6.0	U	6.0	6.7	U	6.7	5.9	U	5.9	7.1	U	7.1
Acetone	VOA	28		7.4	12	J	7.4	22	J	8.3	25	J	7.3	34		8.8
Benzene	VOA	0.64	U	0.64	0.65	U	0.65	0.73	U	0.73	0.64	U	0.64	0.77	U	0.77
Bromodichloromethane	VOA	0.30	U	0.30	0.30	U	0.30	0.34	U	0.34	0.30	U	0.30	0.36	U	0.36
Bromoform	VOA	0.32	U	0.32	0.32	U	0.32	0.36	U	0.36	0.31	U	0.31	0.38	U	0.38
Bromomethane	VOA	0.69	U	0.69	0.69	U	0.69	0.77	U	0.77	0.68	U	0.68	0.82	U	0.82
Carbon disulfide	VOA	0.58	U	0.58	0.58	U	0.58	0.65	U	0.65	0.57	U	0.57	0.69	U	0.69
Carbon tetrachloride	VOA	0.86	U	0.86	0.87	U	0.87	0.98	U	0.98	0.85	U	0.85	1.0	U	1.0
Chlorobenzene	VOA	0.74	U	0.74	0.74	U	0.74	0.84	U	0.84	0.73	U	0.73	0.88	U	0.88
Chloroethane	VOA	1.2	U	1.2	1.2	U	1.2	1.4	U	1.4	1.2	U	1.2	1.5	U	1.5
Chloroform	VOA	0.4	U	0.4	0.40	U	0.40	0.45	U	0.45	0.39	U	0.39	0.47	U	0.47
Chloromethane	VOA	1.1	U	1.1	1.1	U	1.1	1.2	U	1.2	1.0	U	1.0	1.3	U	1.3
cis-1,3-Dichloropropene	VOA	1.8	U	1.8	1.8	U	1.8	2.0	U	2.0	1.7	U	1.7	2.1	U	2.1
Dibromochloromethane	VOA	0.78	U	0.78	0.78	U	0.78	0.88	U	0.88	0.77	U	0.77	0.93	U	0.93
Ethylbenzene	VOA	0.92	U	0.92	0.92	U	0.92	1.0	U	1.0	0.91	U	0.91	1.1	U	1.1
Methylenechloride	VOA	1.0	U	1.0	1.0	U	1.0	1.2	U	1.2	6.5	J	1.0	4.7	J	1.2
Styrene	VOA	0.86	U	0.86	0.87	U	0.87	0.98	U	0.98	0.85	U	0.85	1.0	U	1.0
Tetrachloroethene	VOA	0.81	U	0.81	0.81	U	0.81	0.91	U	0.91	0.80	U	0.80	0.96	U	0.96
Toluene	VOA	1.0	J	0.95	0.95	U	0.95	1.1	U	1.1	0.94	U	0.94	1.1	U	1.1
trans-1,3-Dichloropropene	VOA	0.92	U	0.92	0.92	U	0.92	1.0	U	1.0	0.91	U	0.91	1.1	U	1.1
Trichloroethene	VOA	0.32	U	0.32	0.32	U	0.32	0.36	U	0.36	0.31	U	0.31	0.38	U	0.38
Vinyl chloride	VOA	1.8	U	1.8	1.8	U	1.8	2.1	U	2.1	1.8	U	1.8	2.2	U	2.2
Xylenes (total)	VOA	0.84	U	0.84	0.84	U	0.84	0.94	U	0.94	0.83	U	0.83	1.0	U	1.0

Attachment	1	Sheet	9 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	I. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results

CONSTITUENT	CLASS	FS-8 - J1KRR1 8/25/2011			FS-9 - J1KRP9 8/25/2011			FS-10 - J1KRR0 8/25/2011			FS-11 - J1KRP8 8/25/2011			FS-12 - J1KRP7 8/25/2011		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	1.2	U	1.2	0.66	U	0.66	0.58	U	0.58	0.59	U	0.59	1.1	U	1.1
1,1,2,2-Tetrachloroethane	VOA	1.4	U	1.4	0.77	U	0.77	0.68	U	0.68	0.69	U	0.69	1.3	U	1.3
1,1,2-Trichloroethane	VOA	2.1	U	2.1	1.1	U	1.1	0.97	U	0.97	0.99	U	0.99	1.8	U	1.8
1,1-Dichloroethane	VOA	0.50	U	0.50	0.27	U	0.27	0.23	U	0.23	0.24	U	0.24	0.44	U	0.44
1,1-Dichloroethene	VOA	2.0	J	1.4	1.1	J	0.75	0.65	U	0.65	0.67	U	0.67	1.2	J	1.2
1,2-Dichloroethane	VOA	1.7	U	1.7	0.89	U	0.89	0.78	U	0.78	0.79	U	0.79	1.5	U	1.5
1,2-Dichloroethene(Total)	VOA	0.92	U	0.92	0.49	U	0.49	0.43	U	0.43	0.44	U	0.44	0.82	U	0.82
1,2-Dichloropropane	VOA	1.3	U	1.3	0.70	U	0.70	0.61	U	0.61	0.62	U	0.62	1.2	U	1.2
2-Butanone	VOA	4.7	J	4.3	3.9	J	2.3	2.0	U	2.0	2.2	J	2.1	3.8	U	3.8
2-Hexanone	VOA	12	U	12	6.2	U	6.2	5.4	U	5.4	5.5	U	5.5	10	U	10
4-Methyl-2-Pentanone	VOA	10	U	10	5.5	U	5.5	4.8	U	4.8	4.9	U	4.9	9.1	U	9.1
Acetone	VOA	33	J	13	22	J	6.8	8.2	J	6.0	14	J	6.1	22	J	11
Benzene	VOA	1.1	U	1.1	0.60	U	0.60	0.52	U	0.52	0.53	U	0.53	0.98	U	0.98
Bromodichloromethane	VOA	0.52	U	0.52	0.28	U	0.28	0.24	U	0.24	0.25	U	0.25	0.46	U	0.46
Bromoform	VOA	0.54	U	0.54	0.29	U	0.29	0.25	U	0.25	0.26	U	0.26	0.48	U	0.48
Bromomethane	VOA	1.2	U	1.2	0.63	U	0.63	0.55	U	0.55	0.56	U	0.56	1.0	U	1.0
Carbon disulfide	VOA	0.99	U	0.99	0.53	U	0.53	0.47	U	0.47	0.47	U	0.47	0.88	U	0.88
Carbon tetrachloride	VOA	1.5	U	1.5	0.80	U	0.80	0.70	U	0.70	0.71	U	0.71	1.3	U	1.3
Chlorobenzene	VOA	1.3	U	1.3	0.68	U	0.68	0.60	U	0.60	0.61	U	0.61	1.1	U	1.1
Chloroethane	VOA	2.1	U	2.1	1.1	U	1.1	0.99	U	0.99	1.0	U	1.0	1.9	U	1.9
Chloroform	VOA	0.68	U	0.68	0.37	U	0.37	0.32	U	0.32	0.33	U	0.33	0.61	U	0.61
Chloromethane	VOA	1.8	U	1.8	0.98	U	0.98	0.85	U	0.85	0.87	U	0.87	1.6	U	1.6
cis-1,3-Dichloropropene	VOA	3.0	U	3.0	1.6	U	1.6	1.4	U	1.4	1.5	U	1.5	2.7	U	2.7
Dibromochloromethane	VOA	1.3	U	1.3	0.72	U	0.72	0.63	U	0.63	0.64	U	0.64	1.2	U	1.2
Ethylbenzene	VOA	1.6	U	1.6	0.85	U	0.85	0.74	U	0.74	0.76	U	0.76	1.4	U	1.4
Methylenechloride	VOA	1.8	U	1.8	1.3	J	0.95	0.83	U	0.83	0.85	U	0.85	2.3	J	1.6
Styrene	VOA	1.5	U	1.5	0.80	U	0.80	0.70	U	0.70	0.71	U	0.71	1.3	U	1.3
Tetrachloroethene	VOA	1.4	U	1.4	0.75	U	0.75	0.65	U	0.65	0.67	U	0.67	1.2	U	1.2
Toluene	VOA	1.6	U	1.6	0.87	U	0.87	0.76	U	0.76	0.78	U	0.78	1.4	U	1.4
trans-1,3-Dichloropropene	VOA	1.6	U	1.6	0.85	U	0.85	0.74	U	0.74	0.76	U	0.76	1.4	U	1.4
Trichloroethene	VOA	0.54	U	0.54	0.29	U	0.29	0.25	U	0.25	0.26	U	0.26	0.48	U	0.48
Vinyl chloride	VOA	3.2	U	3.2	1.7	U	1.7	1.5	U	1.5	1.5	U	1.5	2.8	U	2.8
Xylenes (total)	VOA	1.4	U	1.4	0.77	U	0.77	0.68	U	0.68	0.69	U	0.69	1.3	U	1.3

Attachment	1	Sheet	10 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	I. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results

CONSTITUENT	CLASS	FS-13 - J1KRP6			FS-14 - J1KRP5			FS-16 - J1KRP3			FS-17 - J1KRP2			TRIP Blank - J1KTX5		
		8/25/2011			8/25/2011			8/25/2011			8/25/2011			8/25/2011		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	0.68	U	0.68	0.67	U	0.67	0.63	U	0.63	0.75	U	0.75	4.13	U	4.13
1,1,2,2-Tetrachloroethane	VOA	0.79	U	0.79	0.78	U	0.78	0.73	U	0.73	0.88	U	0.88	4.13	U	4.13
1,1,2-Trichloroethane	VOA	1.1	U	1.1	1.1	U	1.1	1.1	U	1.1	1.3	U	1.3	4.13	U	4.13
1,1-Dichloroethane	VOA	0.27	U	0.27	0.27	U	0.27	0.25	U	0.25	0.30	U	0.30	4.13	U	4.13
1,1-Dichloroethene	VOA	0.77	U	0.77	0.94	J	0.76	1.0	J	0.71	0.85	U	0.85	4.13	U	4.13
1,2-Dichloroethane	VOA	0.91	U	0.91	0.90	U	0.90	0.84	U	0.84	1.0	U	1.0	4.95	U	4.95
1,2-Dichloroethene(Total)	VOA	0.51	U	0.51	0.50	U	0.50	0.47	U	0.47	0.56	U	0.56	4.13	U	4.13
1,2-Dichloropropane	VOA	0.72	U	0.72	0.71	U	0.71	0.66	U	0.66	0.79	U	0.79	4.13	U	4.13
2-Butanone	VOA	4.0	J	2.4	3.0	J	2.4	2.3	J	2.2	2.6	U	2.6	9.90	U	9.90
2-Hexanone	VOA	6.4	U	6.4	6.3	U	6.3	5.9	U	5.9	7.0	U	7.0	9.90	U	9.90
4-Methyl-2-Pentanone	VOA	5.7	U	5.7	5.6	U	5.6	5.2	U	5.2	6.3	U	6.3	9.90	U	9.90
Acetone	VOA	17	J	7.0	26		6.9	45		6.5	22	J	7.7	9.90	U	9.90
Benzene	VOA	0.61	U	0.61	0.60	U	0.60	0.57	U	0.57	0.68	U	0.68	4.13	U	4.13
Bromodichloromethane	VOA	0.29	U	0.29	0.28	U	0.28	0.26	U	0.26	0.32	U	0.32	4.95	U	4.95
Bromoform	VOA	0.30	U	0.30	0.30	U	0.30	0.28	U	0.28	0.33	U	0.33	4.13	U	4.13
Bromomethane	VOA	0.65	U	0.65	0.64	U	0.64	0.60	U	0.60	0.72	U	0.72	8.25	U	8.25
Carbon disulfide	VOA	0.55	U	0.55	0.54	U	0.54	0.51	U	0.51	0.61	U	0.61	4.13	U	4.13
Carbon tetrachloride	VOA	0.82	U	0.82	0.81	U	0.81	0.76	U	0.76	0.91	U	0.91	4.13	U	4.13
Chlorobenzene	VOA	0.70	U	0.70	0.69	U	0.69	0.65	U	0.65	0.78	U	0.78	4.13	U	4.13
Chloroethane	VOA	1.2	U	1.2	1.1	U	1.1	1.1	U	1.1	1.3	U	1.3	8.25	U	8.25
Chloroform	VOA	0.38	U	0.38	0.37	U	0.37	0.35	U	0.35	0.42	U	0.42	4.13	U	4.13
Chloromethane	VOA	1.0	U	1.0	0.99	U	0.99	0.93	U	0.93	1.1	U	1.1	8.25	U	8.25
cis-1,2-Dichloroethylene	VOA													4.13	U	4.13
cis-1,3-Dichloropropene	VOA	1.7	U	1.7	1.7	U	1.7	1.6	U	1.6	1.9	U	1.9	4.13	U	4.13
Dibromochloromethane	VOA	0.74	U	0.74	0.73	U	0.73	0.69	U	0.69	0.82	U	0.82	4.13	U	4.13
Ethylbenzene	VOA	0.87	U	0.87	0.86	U	0.86	0.81	U	0.81	0.97	U	0.97	4.13	U	4.13
Methylenechloride	VOA	0.98	U	0.98	1.7	J	0.96	0.90	U	0.90	1.1	U	1.1	10	U	4.95
Styrene	VOA	0.82	U	0.82	0.81	U	0.81	0.76	U	0.76	0.91	U	0.91	4.13	U	4.13
Tetrachloroethene	VOA	0.77	U	0.77	0.76	U	0.76	0.71	U	0.71	0.85	U	0.85	4.13	U	4.13
Toluene	VOA	0.90	U	0.90	0.94	J	0.89	0.85	J	0.83	0.99	U	0.99	4.13	U	4.13
trans-1,2-Dichloroethylene	VOA													4.13	U	4.13
trans-1,3-Dichloropropene	VOA	0.87	U	0.87	0.86	U	0.86	0.81	U	0.81	0.97	U	0.97	4.13	U	4.13
Trichloroethene	VOA	0.30	U	0.30	0.30	U	0.30	0.28	U	0.28	0.33	U	0.33	4.13	U	4.13
Vinyl chloride	VOA	1.7	U	1.7	1.7	U	1.7	1.6	U	1.6	1.9	U	1.9	8.25	U	8.25
Xylenes (total)	VOA	0.79	U	0.79	0.78	U	0.78	0.73	U	0.73	0.88	U	0.88	4.13	U	4.13

Attachment	1	Sheet	11 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	I. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

Attachment 1. 300-219, 300-224, and 333 WSTF Waste Sites Verification Sample Results

CONSTITUENT	CLASS	TRIP Blank 2 - J1KTX6 8/25/2011		
		ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	0.50	U	0.50
1,1,2,2-Tetrachloroethane	VOA	0.59	U	0.59
1,1,2-Trichloroethane	VOA	0.85	U	0.85
1,1-Dichloroethane	VOA	0.20	U	0.20
1,1-Dichloroethene	VOA	0.57	U	0.57
1,2-Dichloroethane	VOA	0.68	U	0.68
1,2-Dichloroethene(Total)	VOA	0.38	U	0.38
1,2-Dichloropropane	VOA	0.53	U	0.53
2-Butanone	VOA	1.8	U	1.8
2-Hexanone	VOA	4.7	U	4.7
4-Methyl-2-Pentanone	VOA	4.2	U	4.2
Acetone	VOA	5.2	U	5.2
Benzene	VOA	0.45	U	0.45
Bromodichloromethane	VOA	0.21	U	0.21
Bromoform	VOA	0.22	U	0.22
Bromomethane	VOA	0.48	U	0.48
Carbon disulfide	VOA	0.41	U	0.41
Carbon tetrachloride	VOA	0.61	U	0.61
Chlorobenzene	VOA	0.52	U	0.52
Chloroethane	VOA	0.86	U	0.86
Chloroform	VOA	0.28	U	0.28
Chloromethane	VOA	0.74	U	0.74
cis-1,3-Dichloropropene	VOA	1.2	U	1.2
Dibromochloromethane	VOA	0.55	U	0.55
Ethylbenzene	VOA	0.65	U	0.65
Methylenechloride	VOA	0.72	U	0.72
Styrene	VOA	0.61	U	0.61
Tetrachloroethene	VOA	0.57	U	0.57
Toluene	VOA	0.67	U	0.67
trans-1,3-Dichloropropene	VOA	0.65	U	0.65
Trichloroethene	VOA	0.22	U	0.22
Vinyl chloride	VOA	1.3	U	1.3
Xylenes (total)	VOA	0.59	U	0.59

Attachment	1	Sheet	12 of 12
Originator	N. K. Schiffern	Date	10/31/11
Checked	I. B. Berezovskiy	Date	10/31/11
Calc. No.	0300X-CA-V0145	Rev. No.	0

APPENDIX B

DATA QUALITY ASSESSMENT

APPENDIX B

DATA QUALITY ASSESSMENT

VERIFICATION SAMPLING

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2011b). This DQA was performed in accordance with site-specific data quality objectives found in the *300 Area Remedial Action Sampling and Analysis Plan* (300 Area SAP) (DOE-RL 2011).

A review of the sample design (WCH 2011b), the field logbooks (WCH 2011a), and applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design. To ensure quality data, the 300 Area SAP data assurance requirements and the data validation procedures for chemical and radiochemical analysis (BHI 2000a, 2000b) are used as appropriate. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., decision-making purposes). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2006).

Verification sample data collected at the 300-219, 300-224, and 333 WSTF waste sites were provided by the laboratories in two sample delivery groups (SDGs): K3633 and J01261. SDG K3633 was submitted for third-party validation.

Samples in the 300-219, 300-224, and 333 WSTF data set were analyzed using U.S. Environmental Protection Agency (EPA) method 6010 (inductively coupled plasma [ICP] metals), EPA method 7471 (mercury), Northwest total petroleum hydrocarbons (NWTPH-Dx) (total petroleum hydrocarbons [TPH]), EPA Method 300.0 and SW-846 method 9056 (ion chromatography [IC] anions), EPA Method 353.2 (nitrogen in nitrate and nitrite), EPA method 8260 (volatile organic compounds [VOCs]), gamma spectroscopy (gamma energy analysis [GEA]), gross alpha, gross beta, and isotopic uranium analysis. The ICP metals included antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

MAJOR DEFICIENCIES

A major deficiency was noted in SDGs K3633 and J01261 in the IC anions analysis, where the holding times were exceeded by greater than twice the limit on all nitrate, nitrite, and orthophosphate samples. Third-party validation qualified the non-detected nitrite result analyzed by EPA method 300.0 as rejected and flagged "UR" in SDG K3633. All nondetected nitrite and orthophosphate results analyzed by SW-846 method 9056 in SDG J01261 may also be considered rejected.

The issue with the nitrite analyses by methods 300.0/9056 not meeting the holding times was anticipated, and nitrite was analyzed by a second method (EPA 353.2) in both SDGs. The replacement nitrite data are sufficient for the intended purpose. There was no replacement for the rejected orthophosphate data. However, orthophosphate was not a constituent of concern; it was an incidental analyte in the anions analysis. Orthophosphate is not a regulated compound; therefore, the rejection of the orthophosphate data does not impact the evaluation of the 300-219, 300-224, and WSTF 333 data. The final data set is useable for decision-making purposes.

MINOR DEFICIENCIES

Minor deficiencies are discussed below. If no comments are made about a specific analysis it should be assumed that no deficiencies in the quality of the data were found. Unless otherwise noted deficiencies listed below are specific to the individual SDG, but apply to all samples within that SDG.

SDG K3633

This SDG comprises two samples (J1KTX5 and J1KTT9) collected from the 300-219, 300-224, and 333 WSTF waste sites. Sample J1KTX5 is a trip blank, and sample J1KTT9 is a split of sample J1KRP4, from SDG J01261). SDG K3633 was submitted for formal third-party validation. Minor deficiencies found in SDG K3633 are as follows:

In the VOC analysis, the method blank showed contamination for methylene chloride. During third-party validation, all methylene chloride results in SDG K3633 were raised to the required quantitation limit, qualified as undetected, and flagged "U."

In the TPH analysis, the laboratory did not spike the laboratory control standard (LCS), matrix spike (MS), or matrix spike duplicate (MSD) with a motor oil standard. Third-party validation qualified the motor oil result in SDG K3633 as estimated with "J" flags. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, the MS recovery for antimony (51.6%) was below project acceptance criteria (70% to130%). Third-party validation qualified the antimony result in SDG K3633 as estimated with "J" flags. Estimated data are useable for decision-making purposes.

In the IC anion and pH analyses, the holding times for nitrate, nitrite, orthophosphate, and pH were exceeded by more than twice the acceptable range on all samples. Nitrate and orthophosphate were detected in the only sample analyzed; whereas, nitrite was nondetected. Third-party validation has qualified the pH result and the detected nitrate and orthophosphate results in SDG K3633 with "J" flags as estimated. Estimated data are useable for decision-making purposes. The nondetected nitrite and orthophosphate results are discussed in the "Major Deficiencies" section above.

In the IC anion analysis, the method blank showed contamination for sulfate. During third-party validation, the sulfate result in SDG K3633 was raised to the required quantitation limit, qualified as undetected, and flagged "U."

In the IC anion analysis, the relative percent difference (RPD) calculated using the laboratory duplicate for chloride (38.3%) was above the acceptance criteria (30%). Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix rather than to analytical variability in the sample extraction or analysis process. Third-party validation did not qualify this result; however, the chloride result for SDG K3633 may be considered estimated. Estimated data are useable for decision-making purposes.

In the isotopic uranium analysis, an LCS analysis was not performed for uranium-235. Due to the lack of an LCS analysis, third-party validation has qualified the uranium-235 result in SDG K3633 as estimated with "J" flags. Estimated data are useable for decision-making purposes.

In the gross alpha analysis, the RPD (68%) was above the acceptance criteria (30%). Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix rather than to analytical variability in the sample extraction or analysis process. The gross alpha result for SDG K3633 may be considered estimated. Estimated data are useable for decision-making purposes.

SDG J01261

This SDG comprises 20 samples (J1KRP1-9, J1KRR0-9, and J1KTX6) collected from the 300-219, 300-224, and 333 WSTF waste sites. Sample J1KRR3 is a field duplicate of sample J1KRR2. Sample J1KRP1 is an equipment blank. Sample J1KTX6 is a trip blank. Minor deficiencies found in SDG J01261 are as follows:

In the VOC analysis, the sample size used in preparation of the MS and MSD for the RPD exceeded 10% difference, resulting in elevated RPD values. The RPD project control limit (<30%) was exceeded for the following analytes: benzene; bromodichloromethane; 2-butanone; 1,2-dichloroethane; 1,2-dichloropropane; cis-1,3-dichloropropene; trans-1,3-dichloropropene; 1,1,2,2-tetrachloroethane; toluene; 1,1,2-trichloroethane, trichloroethene, and vinyl chloride. All results for these analytes in SDG J01261 may be considered estimated. Estimated data are useable for decision-making purposes.

In the TPH analysis, the MS and MSD recoveries for C10-C36 (38% to 43%, respectively) were below project control limits (50% to 150%). All C10-C36 results in SDG J01261 may be considered estimated. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for silicon (23%) was below project control limits (70% to 130%). All silicon results in SDG J01261 may be considered estimated. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for antimony (51%) and silicon (25%) were below project control limits (70% to 130%). All antimony and silicon results in SDG J01261 may be considered estimated. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, the laboratory duplicate RPD calculated for silicon (33%) was above the acceptance criteria (less than 30%). Elevated RPDs in environmental samples are generally attributed to natural heterogeneity in the sample matrix. All silicon results in SDG J01261 may be considered estimated. Estimated data are useable for decision-making purposes.

In the IC anion analysis, the holding times for nitrate, nitrite, and orthophosphate analysis were exceeded by more than twice the limit on all samples. Nitrate was detected in all samples; whereas, nitrite and orthophosphate were nondetected in all samples, with the exception of one sample (J1KRR7) where orthophosphate was detected. All detected nitrate and orthophosphate results in SDG J01261 may be considered estimated. Estimated data are useable for decision-making purposes. The nondetected nitrite and orthophosphate results are discussed in the "Major Deficiencies" section above.

In the pH analysis, the holding times were exceeded by more than twice the limit on all samples. All pH results for SDG J01261 may be considered estimated. Estimated data are useable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

RPD evaluations of main sample(s) versus the laboratory duplicate(s) are routinely performed and reported by the laboratories. Any deficiencies in those calculations are reported by SDG in the previous sections.

Field quality assurance (QA)/quality control (QC) measures are used to assess potential sources of error and cross contamination of samples that could bias results. Two sets of field QA/QC samples (main sample and duplicate) were collected, as documented in the field logbook (WCH 2011a). Sample J1KRR2 is the field duplicate of sample J1KRR3, and sample J1KTT9 is the split of sample J1KRP4.

The entire sample data set including the duplicate and split sample data are presented in the RPD calculation in Appendix A. RPDs for the field duplicate and split samples have been calculated and are also presented in the RPD calculation. Please refer to the RPD calculation for details.

Field duplicate samples provide a relative measure of the degree of local heterogeneity in the sampling medium, unlike laboratory duplicates that are used to evaluate precision in the analytical process. The field duplicates are evaluated by computing the RPD of the sample/duplicate pair(s), for each contaminant of concern. No major or minor deficiencies in the RPD calculations were found for the field duplicate samples. All field duplicate RPDs calculated were below the field duplicate acceptance criteria (less than 30%).

Field split samples are used to determine systematic differences (bias) between laboratories. A statistical determination of systematic differences would require larger data sets than are presented here.

Such a determination is complicated by variability introduced by the natural heterogeneities inherent in field soil samples and the analytical variability that each individual laboratory experiences. Therefore, when evaluating limited field split data, relatively large RPDs are expected. No major deficiencies in the RPD calculations were found for the split samples. Minor deficiencies for the split samples are as follows:

In the split evaluation, the RPD calculated for silicon (40.7%) was above the field split acceptance criteria (less than 35%). Elevated RPDs in environmental samples are generally attributed to natural heterogeneity in the sample matrix. The data are useable for decision-making purposes.

A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are useable for decision-making purposes.

SUMMARY

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 300-219, 300-224, and 333 WSTF waste sites verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling.

The DQA review for the 300-219, 300-224, and 333 WSTF waste sites concludes that the reviewed data are of the right type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and sampling data group completeness were assessed to determine if any analytical results should be rejected as a result of QA and QC deficiencies. With the exception of the rejected nitrite and orthophosphate data, the analytical data were found acceptable for decision-making purposes. The verification sample analytical data are stored in the environmental restoration project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System database. The verification sample analytical data are also summarized in Appendix A.

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